NAPIER AVENUE

PEDESTRIAN & BICYCLE PLAN

Final Report

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SWMPC Southwest Michigan Planning Commission

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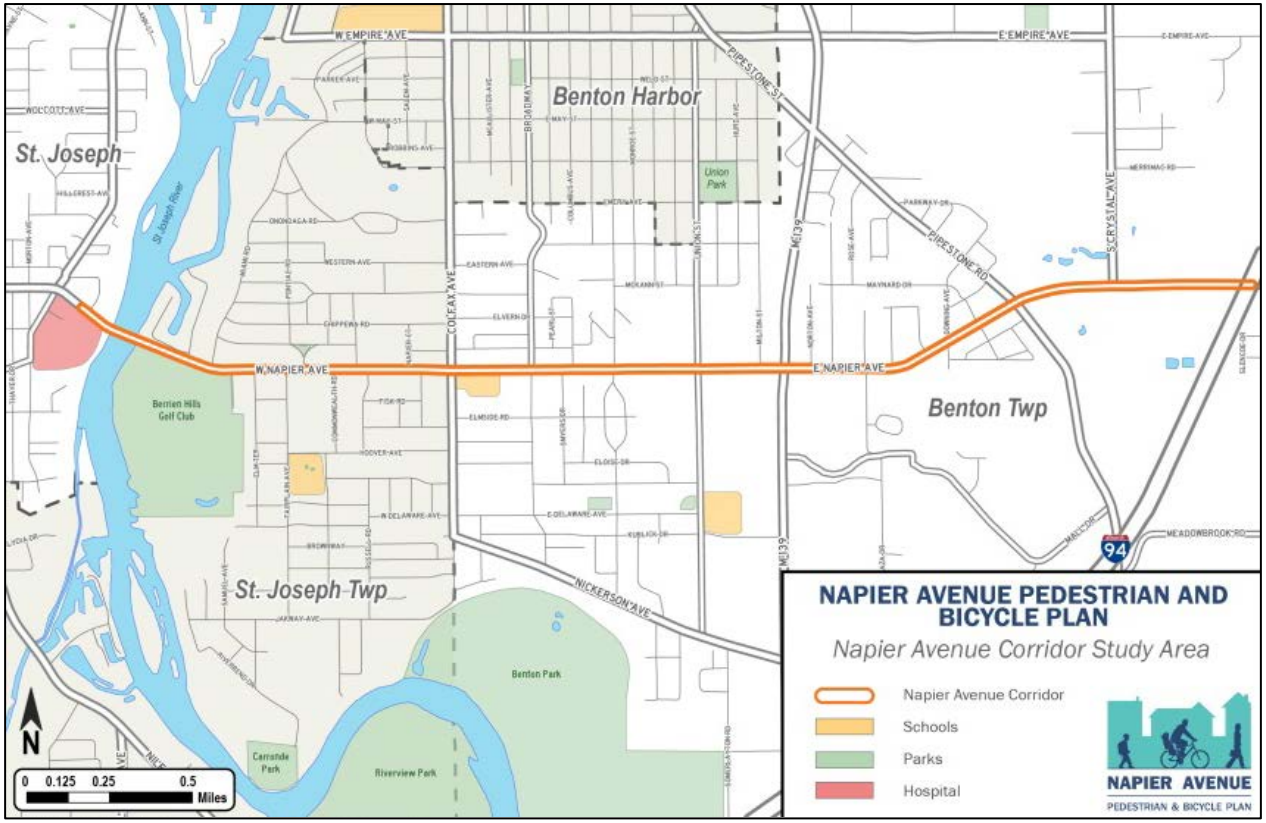
1.0 Introduction

The Napier Avenue Corridor is an important east-west transportation corridor in the Benton Harbor – St. Joseph metro area, providing connectivity from the expressway into the core cities, providing access to major shopping and medical destinations, and serving a number of neighborhoods and community businesses. While it may function well for vehicular travel, it is not ideal for non-motorized users. The existing condition of Napier Avenue is simply not comfortable and safe for all users, and in many places is lacking basic pedestrian infrastructure such as sidewalks and crosswalks. The Corridor is heavily traveled and has a variety of land uses that serve essential functions including healthcare (Lakeland Hospital) at its west end and employment, education, and retail on its east end (Fairplain Plaza, Orchards Mall, businesses along M-139).

Figure 1-1: Napier Avenue Corridor Study Area



The Napier Avenue Pedestrian and Bicycle Plan was initiated in 2017 to document the need for pedestrian and bicycle uses, examine options for how to better meet those needs, and develop a design and implementation strategy. This document presents the final results of the study.

1.1 Purpose and Need

The Plan addresses the need for non-motorized improvements on Napier Avenue with the purpose of:

Addressing gaps in the bike and pedestrian network

Promoting safety for all users

Meeting residents' needs

Supporting existing and future development

Enhancing regional connectivity

While the Napier Avenue corridor is home to a significant population in need of safe, walkable infrastructure, facilities for walking and biking are frequently missing, and the Corridor requires safety enhancements for all users (see Figure 1-2). Furthermore, walkability and pedestrian friendliness are becoming more and more important to people when choosing where to live, signaling that future revitalization and development may be more attractive to developers if Napier Avenue and the surrounding streets feature facilities for all users. Finally, Napier Avenue could better connect the region to jobs, shopping, and other destinations by improving access via all travel modes.

Figure 1-2: Desire Path along Napier Avenue

1.2 Plan Process

In order to address the needs for non-motorized improvements on Napier Avenue, the Plan has identified what pedestrian and bicycle facilities are appropriate for the Corridor through a process of understanding existing conditions, developing and evaluating alternatives, and engaging with stakeholders and the public.

A steering committee was assembled at the start of the project to guide the direction of the Plan, and a walkability audit was performed by the project team and the steering committee to establish an on-the-ground understanding of the study area. A public meeting and survey were also held to help educate the public on issues surrounding the Corridor today and potential solutions, gather input and perspectives from those who use the corridor, and identify the public's top priorities for future improvements (see Figure 1-3).

After an understanding of the Corridor's existing conditions was established, alternative options for the Corridor were developed with public feedback from the survey and meeting in mind. Criteria were developed to evaluate these different options and identify the preferred alternative for Napier Avenue.

Figure 1-3: Public Meeting at Overflow Community Church

1.3 Plan Partners

The Napier Avenue Pedestrian and Bicycle Plan has been developed through the leadership of Southwest Michigan Metropolitan Planning Commission (SWMPC) and with the support of a committee of representatives from adjacent communities and interested agencies. The membership of the Steering Committee included:

Ryan Fellows - SWMPC

Kim Gallagher – SWMPC

Debbie Boothby – Benton Charter Township

Denise Cook – St. Joseph Charter Township

Jonathan Fisk – St. Joseph Charter Township

Brian Berndt – Berrien County Road Department

Heather Cole – Be Healthy Berrien

Jim Paul – Slumberland Furniture Store

John Curtis – Napier Shell

Alex Little – Twin Cities Area Transportation Authority

Ellis Mitchell – Twin Cities Area Transportation Authority

Jason Latham – Berrien Co. Road Department

Stephanie Scott-Simms – City of Benton Harbor

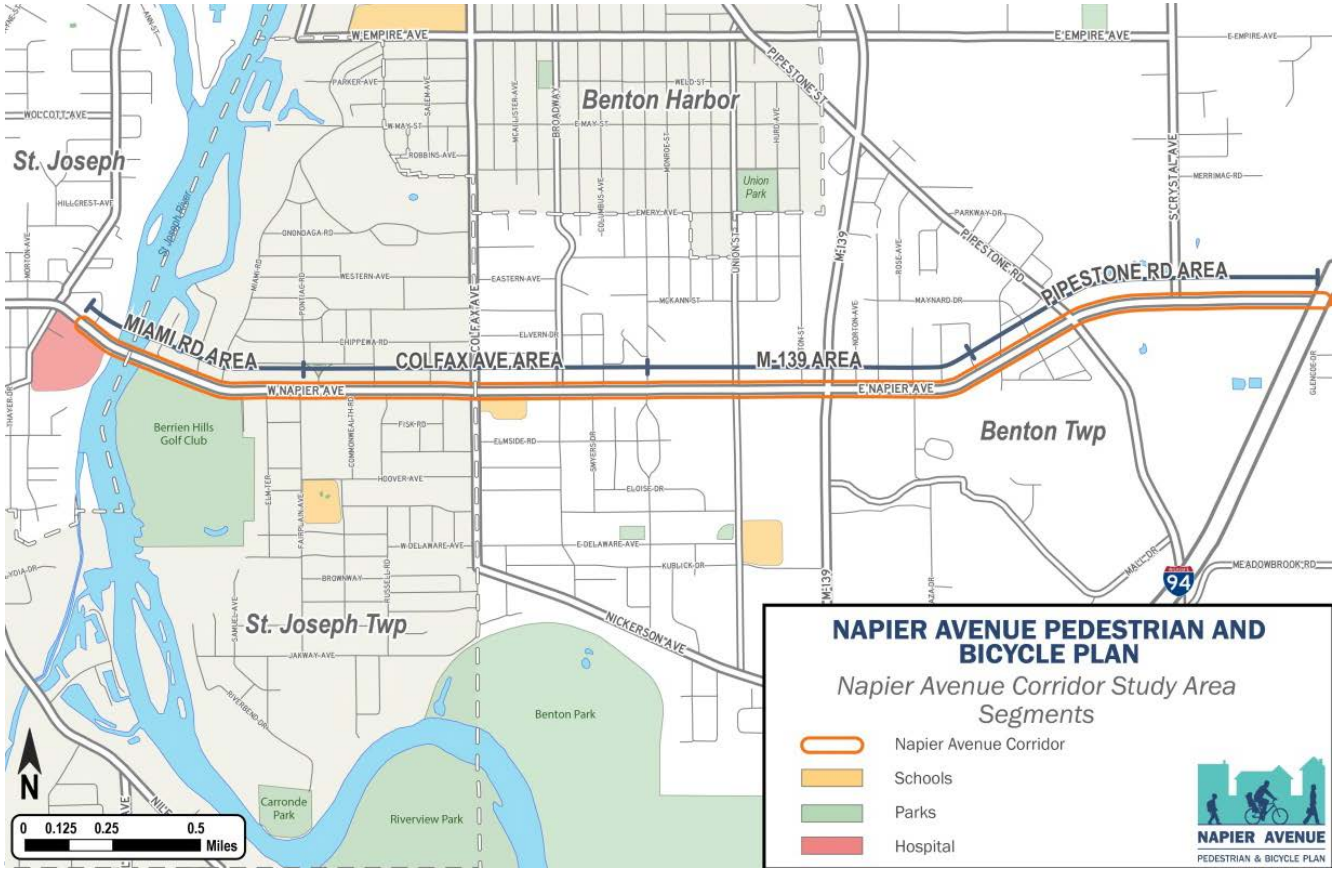
2.0 Alternative Development and Evaluation

2.1 Development of Alternatives

Following initial engagement around the needs for pedestrians and bike infrastructure in the corridor, the team developed a series of options for potentially reconfiguring the corridor to better meet these needs. Areas of Napier Avenue with similar existing conditions were grouped into the following Corridor segments:

- **Miami Road Area** – Lakeland Medical Center to Pontiac Road
- **Colfax Avenue Area** – Pontiac Road to Ogden Avenue
- **M-139 Area** – Ogden Avenue to Leeds Avenue
- **Pipestone Road Area** – Leeds Avenue to I-94

Figure 2-1: Napier Avenue Corridor Segments



The project team developed five specific alternatives to be evaluated in the context of each of the Corridor segments:

Figure 2-2: Miami Road and Colfax Avenue Area Alternatives

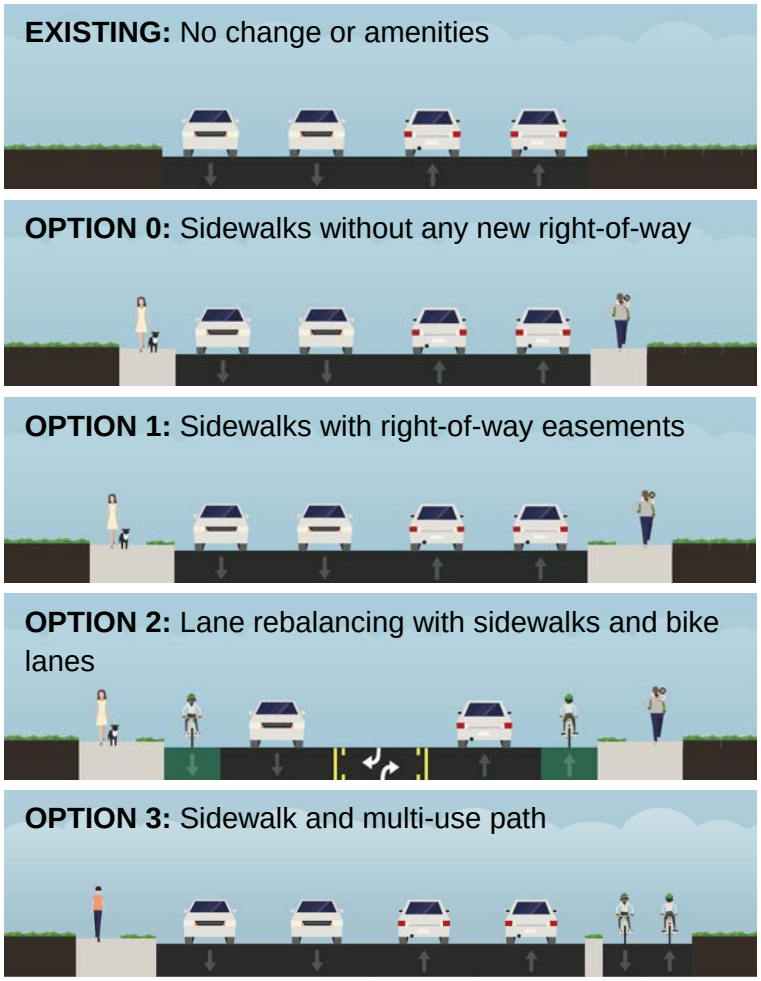
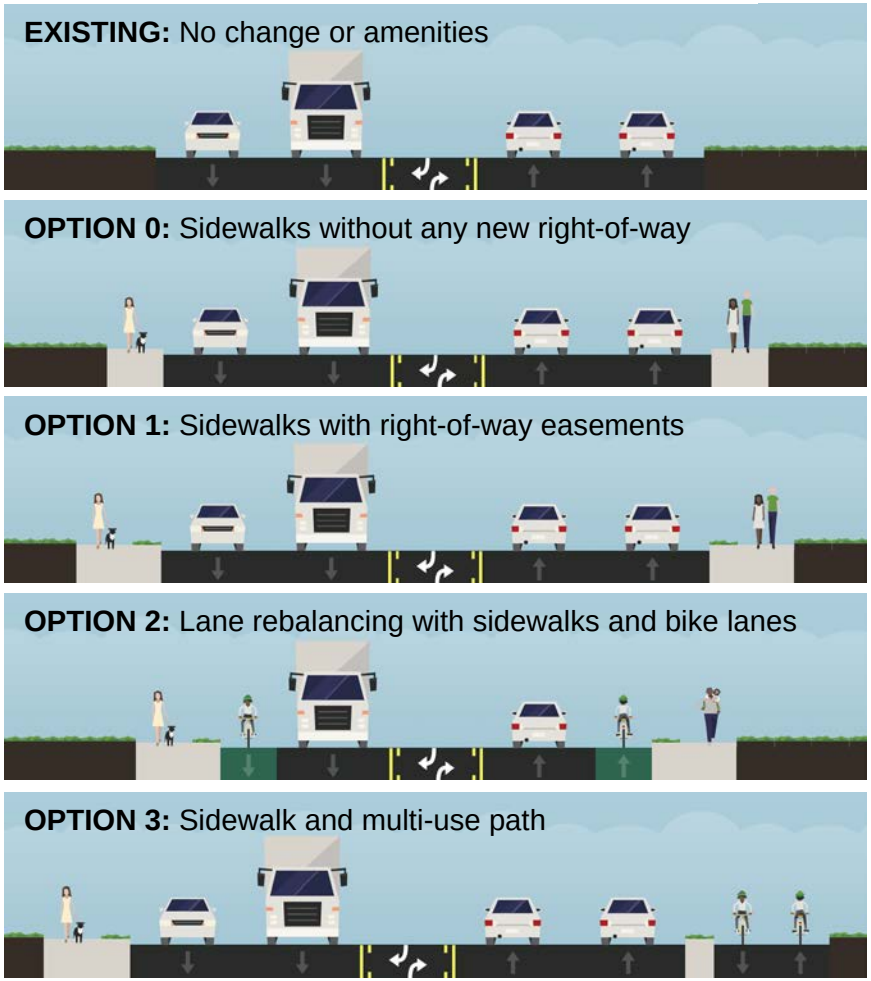


Figure 2-3: M-139 and Pipestone Road Area Alternatives



2.2 Evaluation of Alternatives

In order to arrive at a preferred alternative for Napier Avenue, each of the alternatives were evaluated in the context of the four segments of the Corridor using the following eight criteria:

- **Cost** – How much the project would cost to build.
- **Easement needs** – How many adjacent property owners would need to establish the right for pedestrians and bicyclists to use non-motorized facilities on their property.
- **Maintenance of infrastructure** – How much additional maintenance would be needed.
- **Traffic and safety impacts** – Level-of-service acceptability and associated safety impacts.
- **Pedestrian safety and comfort** – How pedestrians would feel and how close they would be to vehicular traffic.
- **Bicyclist safety and comfort** – How bicyclists would feel and how close they would be to vehicular traffic.
- **Regional connectivity** – Extent to which connections to jobs, shopping, and recreation would be enhanced.
- **Public and stakeholder support** – Level of resident and stakeholder support and extent to which the alternative is in the community's best interest.

For each criterion, alternatives were scored on the following scale:

- **Best** – The most desirable or greatest possible outcome for this criterion.
- **Good** – May not be the best possible solution but more than adequately addresses the needs of the criterion.
- **Fair** – Provides an alternative that improves upon existing conditions and is viewed as acceptable but not ideal.
- **No improvement** – Does not create any noticeable changes for the better or worse than what currently exists.
- **Worse** – Provides a situation that is less desirable than the existing conditions.

The resulting evaluation provided a basis upon which the alternatives for each segment could be compared to one another. Alternatives that scored highest among their peers rose to the top as the preferred alternative for that segment of Napier Avenue.

Scores for the public and stakeholder support criterion came from input during a public meeting and an online survey on the most desired concept alternatives for Napier Avenue.

3.0 Preferred Alternative

Based on the alternative evaluation, different preferred alternatives are being recommended for differing segments of the corridor.

3.1 West End (Miami - Colfax)

The recommended alternative for the west end of the corridor is Option 2 (Lane Rebalancing), which would involve converting the current four-lane section into a three-lane with bike lanes along the curb lines. In addition, continuous sidewalks and safe crossings would be integrated with this design (see Figure 3-1 and Figure 3-2 on the next page). The cost of implementing these new pedestrian facilities on the west end of the Corridor is estimated at approximately $1.1 million (see Appendix A).

Reconfiguring lanes through this section is consistent with the general residential and small-scale commercial character of the corridor, and would add dedicated bicycle facilities where the public indicated they would most like to see bicycle access improved. The design would also provide additional buffering between the automobile lanes and the sidewalks along the edges.

Another key factor is that the lane rebalancing through this segment could likely be achieved without major reconfiguration of the curb lines and without significant right-of-way needs, two factors which can increase the cost and complexity of a street project. Although there was some level of support for a multi-use path through this segment, this would be a much more difficult project to implement.

An important consideration in implementing this conversion is ensuring that impacts to traffic delays and congestion levels are not significant. A traffic engineering analysis was completed to support the final implementation decision. This analysis concluded that the lane reconfiguration is expected to have little or no additional impact on traffic operations on Napier Avenue, but that a shared eastbound bike/right-turn lane should be included at the Colfax Avenue intersection (see Appendix B and Figure 3-2 on the next page).

Figure 3-1: Miami - Colfax Preferred Alternative - Section View

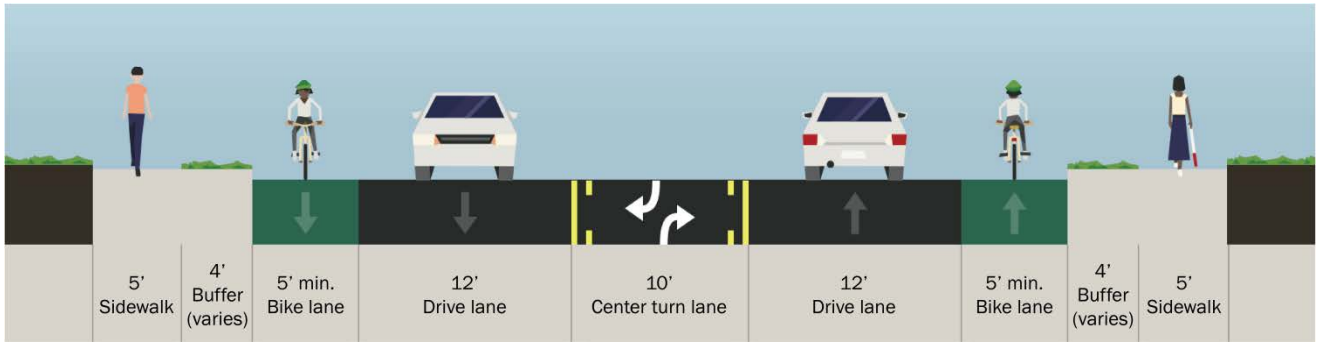
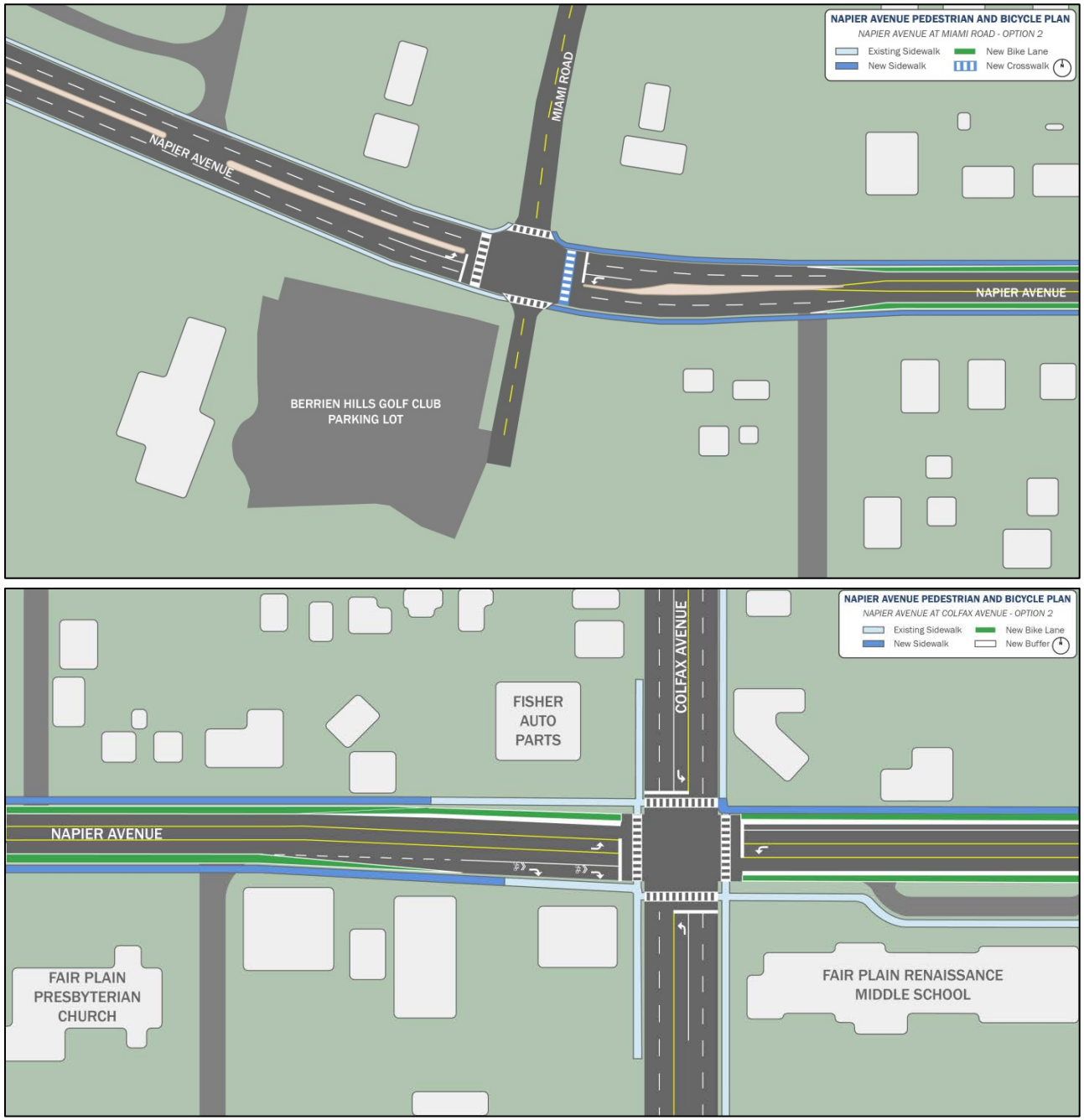


Figure 3-2: Miami - Colfax Preferred Alternative - Plan View



3.2 East End (M-139 - Pipestone)

The recommended alternative for the east end of the corridor is Option 3: the addition of sidewalks to both sides of the existing roadway with the eventual development of a multi-use path on the south side of Napier Avenue (see Figure 3-3 and Figure 3-4 on the next page).

Due to the current five-lane roadway configuration through this corridor and large numbers of trucks, an option that includes bike facilities on the street is not preferred in this segment. Instead, most bicycle users would be much more comfortable with a separated facility, as reflected in public input.

The multi-use path on the south side of Napier Avenue is not feasible in the area by the cemetery between Pipestone Road and Crystal Avenue, so a sidewalk is preferred here. In addition, sidewalks instead of a multi-use path are recommended from the cemetery to I-94 until the US-31 freeway connection is built and further traffic analysis can be performed to determine whether or not on-street bicycle facilities can be added.

The vision for the future corridor could be implemented over time, with sidewalk infrastructure (as presented in Option 1) being used to improve conditions in the short term for pedestrians, while maintaining space for the longer-term upgrade to bicycle mobility along the south side of the corridor via a multi-use path. In the public input, there were many who indicated concerns over right-of-way acquisition and costs, indicating that the gradual addition of sidewalks on one or both sides of the existing roadway could be a good waypoint towards the preferred option.

The cost of implementing the preferred alternative on the east end of Napier Avenue is estimated at approximately $1.3 million (see Appendix A).

Figure 3-3: M-139 - Pipestone Preferred Alternative - Section View

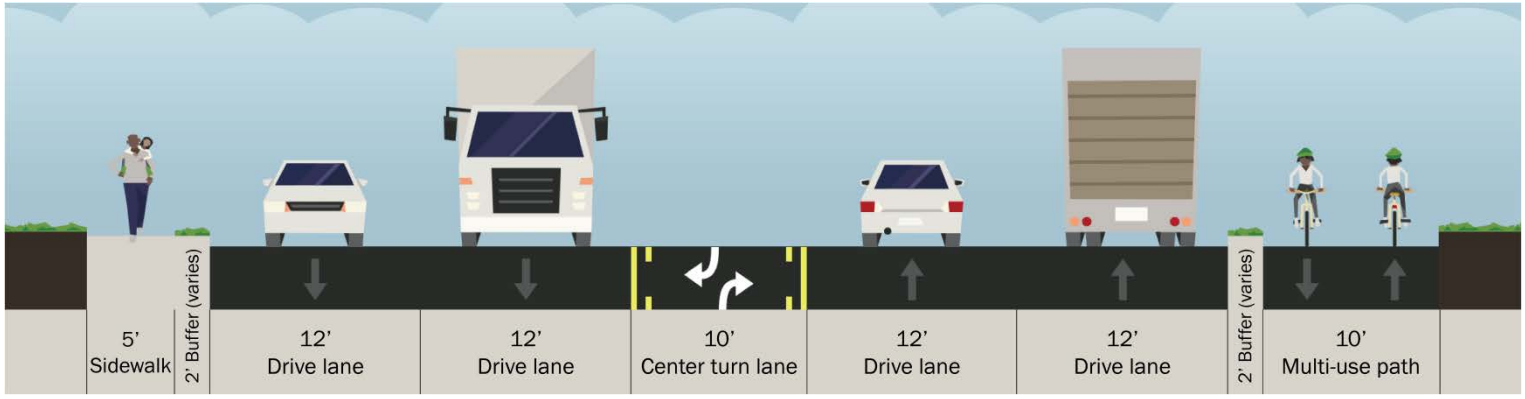
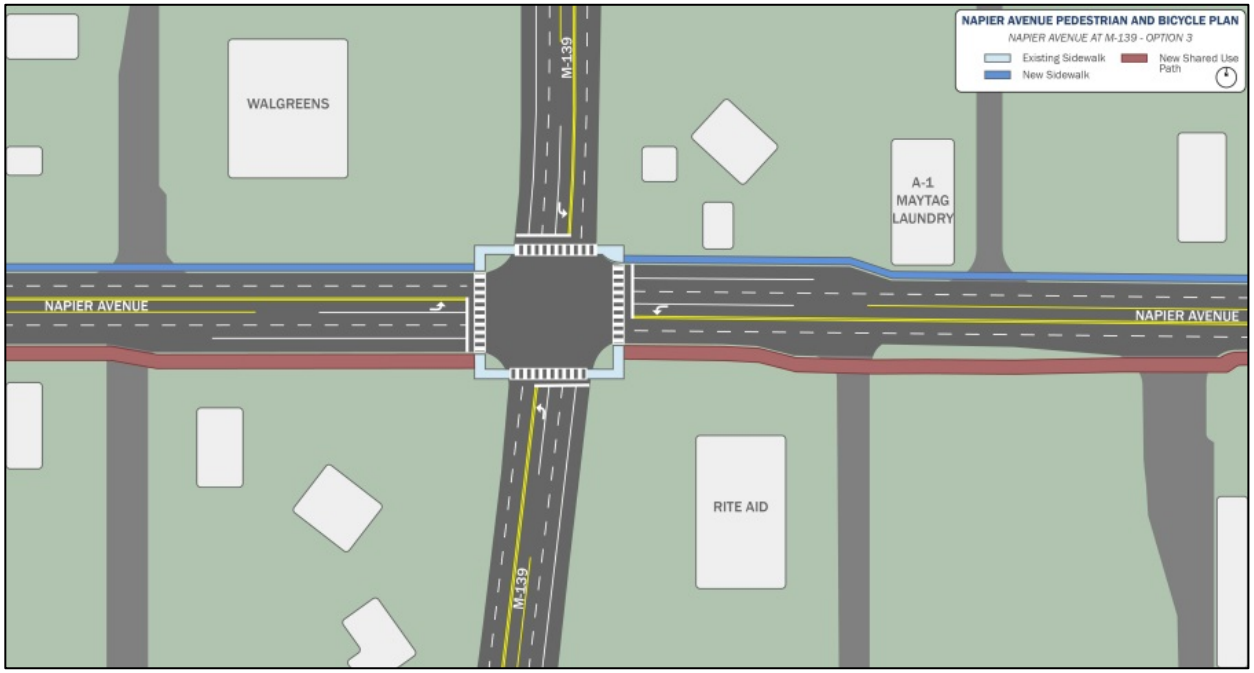
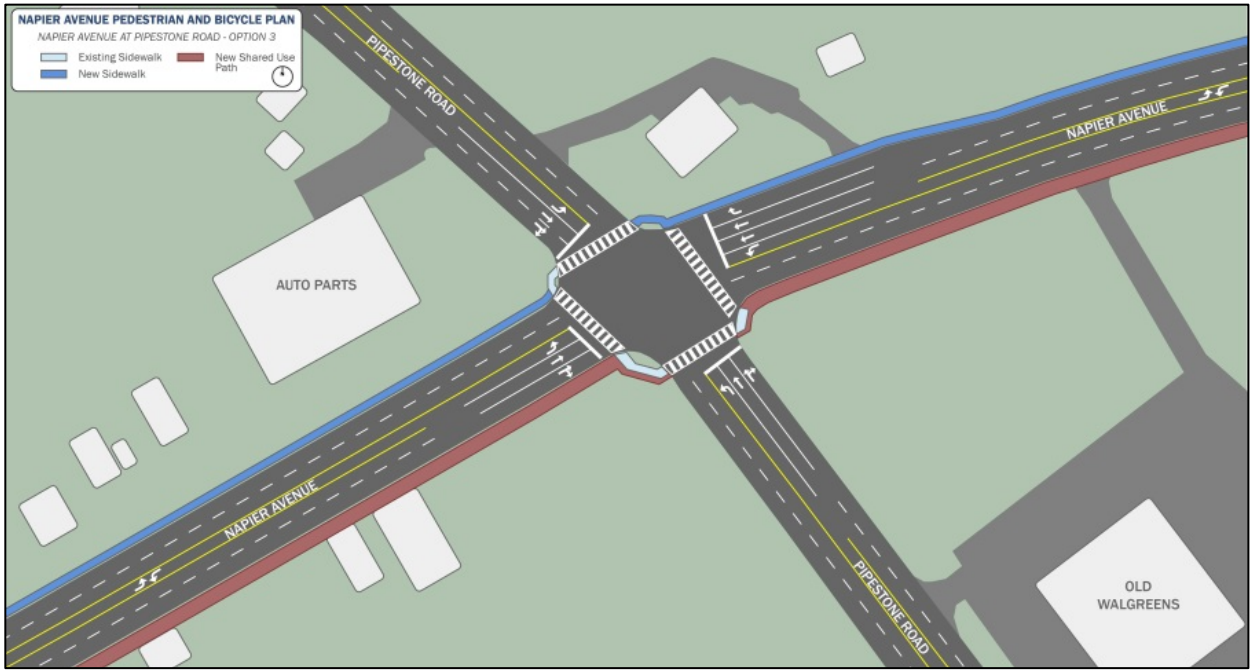


Figure 3-4: M-139 - Pipestone Preferred Alternative - Plan View





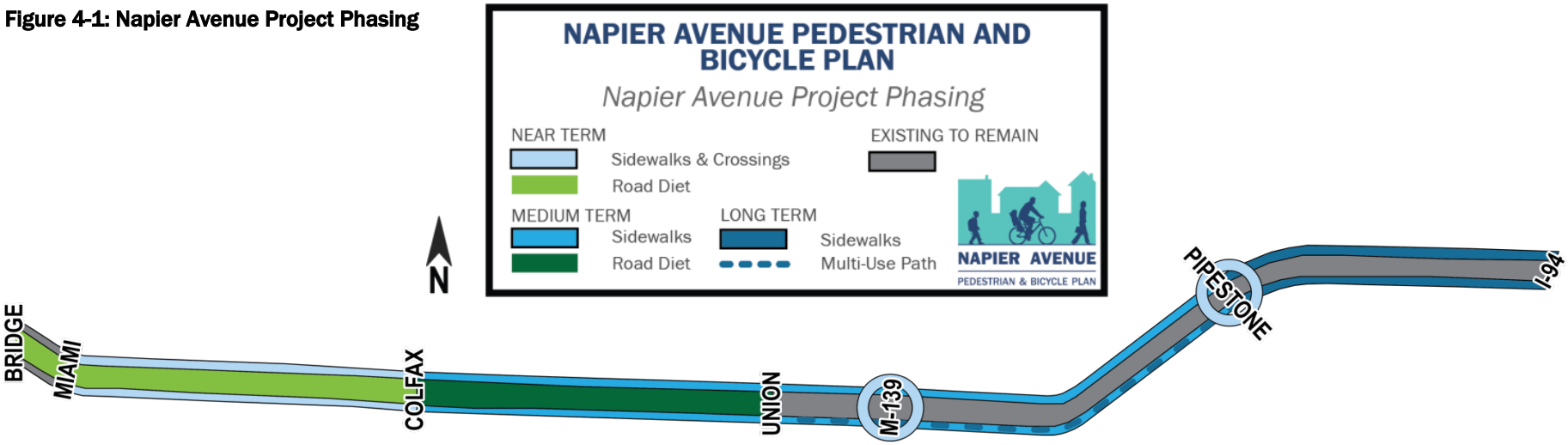
4.0 Implementation

4.1 Project Phasing

Implementation of the preferred alternative for Napier Avenue is recommended to occur in the following phases:

Phase	Implementation Step	Where
Near Term	Road diet and bike lanes	Bridge to Colfax Avenue
	Sidewalks and pedestrian crossings	Miami Road to Colfax Avenue
	Enhanced crossings	At M-139 and Pipestone Road
Medium Term	Road diet and sidewalks	Colfax Avenue to Union Avenue
	Sidewalks	Colfax Avenue to Pipestone Road
Long Term	Sidewalks	Pipestone Road to I-94
	Multi-use path	Union Avenue to Pipestone Road

Figure 4-1: Napier Avenue Project Phasing



Near Term

Sidewalks already exist along Napier Avenue between the Lakeland Regional Medical Center and Miami Road, and should continue to be utilized.

Rebalancing lanes between the east end of the bridge and Colfax Avenue would convert the segment from 4 lanes to 3 lanes (excluding intersections). This segment of Napier Avenue is recommended first for implementation because changes here require minimal right-of-way and mainly entail reconfiguring lanes by restriping the roadway. In addition, this area is the most highly prioritized by stakeholders and the public. Reconfiguring this segment alone at first gives the public time to become accustomed to the new road configuration and for roadway improvements to be tested not only for their immediate locations but also for other future locations on the Corridor. This “pilot” phase of the new lane configuration ultimately aims to demonstrate its success and garner support for its continued application in other segments of the Corridor. A prime opportunity for lane reconfiguration on Napier Avenue between the bridge and Colfax Avenue is in conjunction with the Berrien County Road Department’s road resurfacing project scheduled for 2019 starting at the river and extending 3,700 feet east. At the same time that lanes for vehicular traffic are reconfigured, bike lanes can be added to the roadway along the curb lines, denoted with color and/or lane markings as well as signage (see Figure 4-2 on the following page).

Implementing sidewalks where they currently do not exist is also a near-term priority in project phasing, and is recommended to begin with the Miami Road area. This segment of the Corridor is most highly prioritized by stakeholders and the public, and it has minimal right-of-way needs.

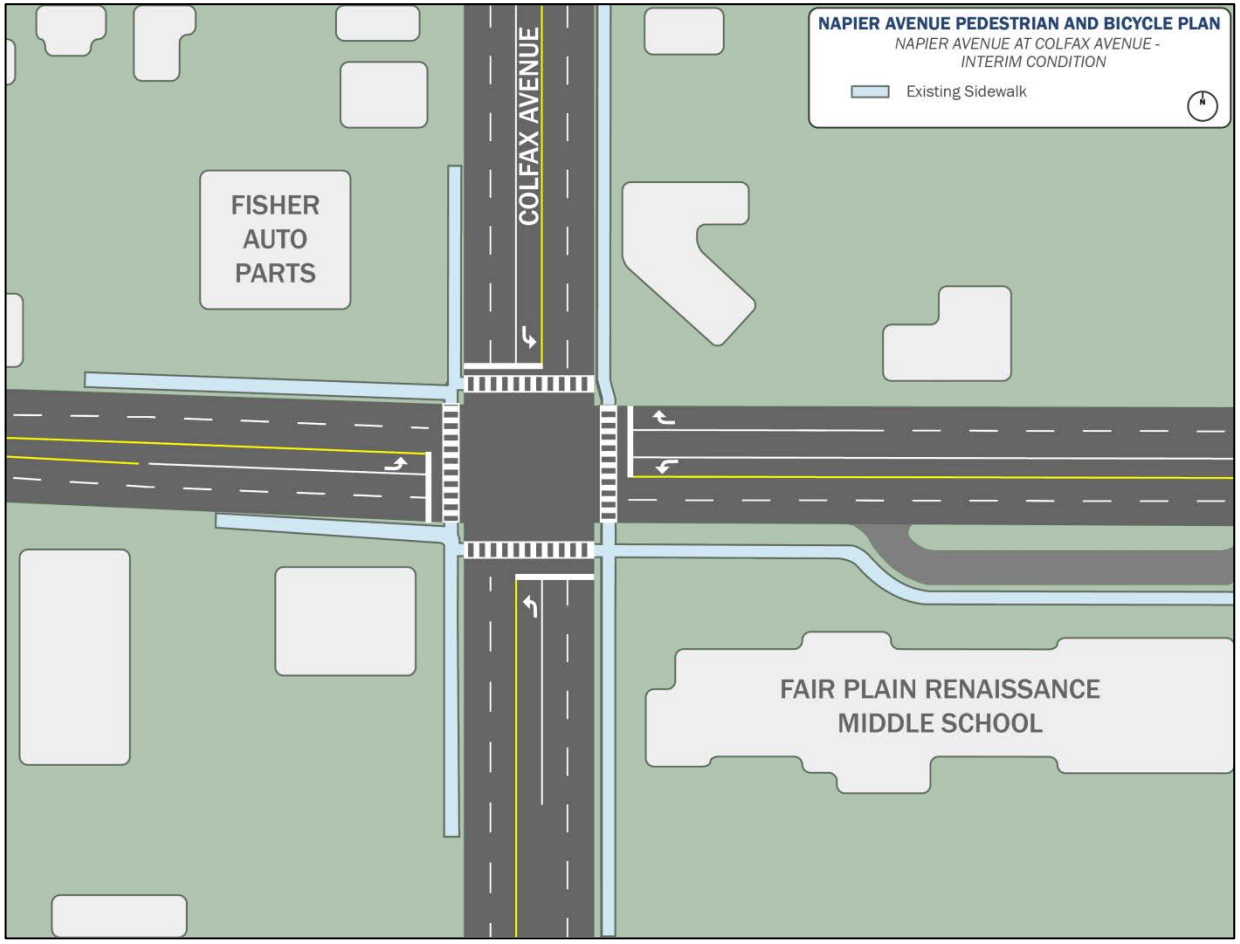
Pedestrian crossings should be implemented in conjunction with sidewalks to create a continuous pedestrian network and maintain pedestrian safety. Existing crossings at the M-139 and Pipestone Road intersections should be enhanced. Coordinating intersection modifications with other planned roadway projects on the Corridor, such as the Berrien County Road Department’s traffic signal replacement on Napier Avenue at Leeds Avenue, will allow several improvements to be made at once, creating smoother transitions for all Corridor users.

Figure 4-2: Near Term Project Phasing

Medium Term

After lanes are rebalanced in the near-term, the new lane configuration should be continued from Colfax Avenue to Union Avenue. However, in the interim condition, the rightmost through lane for westbound traffic at Colfax Avenue will need to be converted from a shared through/right turn lane into a dedicated right turn lane. This will be achieved by modifying pavement markings and adding suitable lane assignment signs for westbound traffic at Colfax Avenue (see Figure 4-3).

Figure 4-3: Interim Lane Configuration at Colfax Avenue



Once this interim lane configuration is achieved, the segment of Napier Avenue from Colfax Avenue to Union Avenue can be converted from 4 lanes to 3 lanes (excluding intersections), and bike lanes can be added along the curb lines (see Figure 4-4 on the next page).

Sidewalks should continue to be added to the Corridor from Colfax Avenue to Pipestone Road as funding allows.

The aim for the east end of the corridor is a multi-use path on the south side, and the gradual addition of sidewalks on either side of Napier Avenue will help to complete the non-motorized network as easements are assembled.

Figure 4-4: Medium Term Project Phasing

Long Term

The sidewalk network should be completed from Pipestone Road to I-94 and the multi-use path on the south side of Napier Avenue should be added from Union Avenue to Pipestone Road. This part of the project has the greatest easement needs and will require the most extensive construction. Even though buildout of the multi-use path is a long term implementation item, gathering the required easements for this phase can begin at any point in the implementation process.

Figure 4-5 on the following page shows what the implemented multi-use path might look like in the future.

MDOT Sidepath Intersection & Crossing Treatment Guide

Multi-use path design should aim to include:

- Path width of at least 10 feet for a two-way facility
- Signage and markings to remind motorists to yield to bicyclists and pedestrians
- Raised crossings of at least 6 inches
- Offset from roadway where possible
- Curb radii of no more than 15 feet
- Signalization thresholds
  - 100 vehicles per hour for right turns
  - 50 vehicles per hour for left turns across one lane
  - 0 vehicles per hour for left turns across two lanes

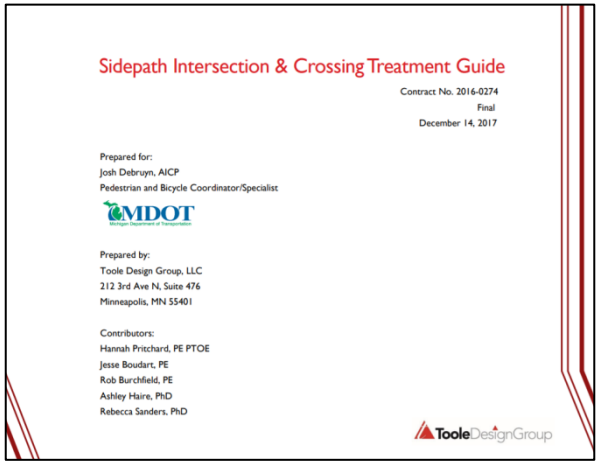
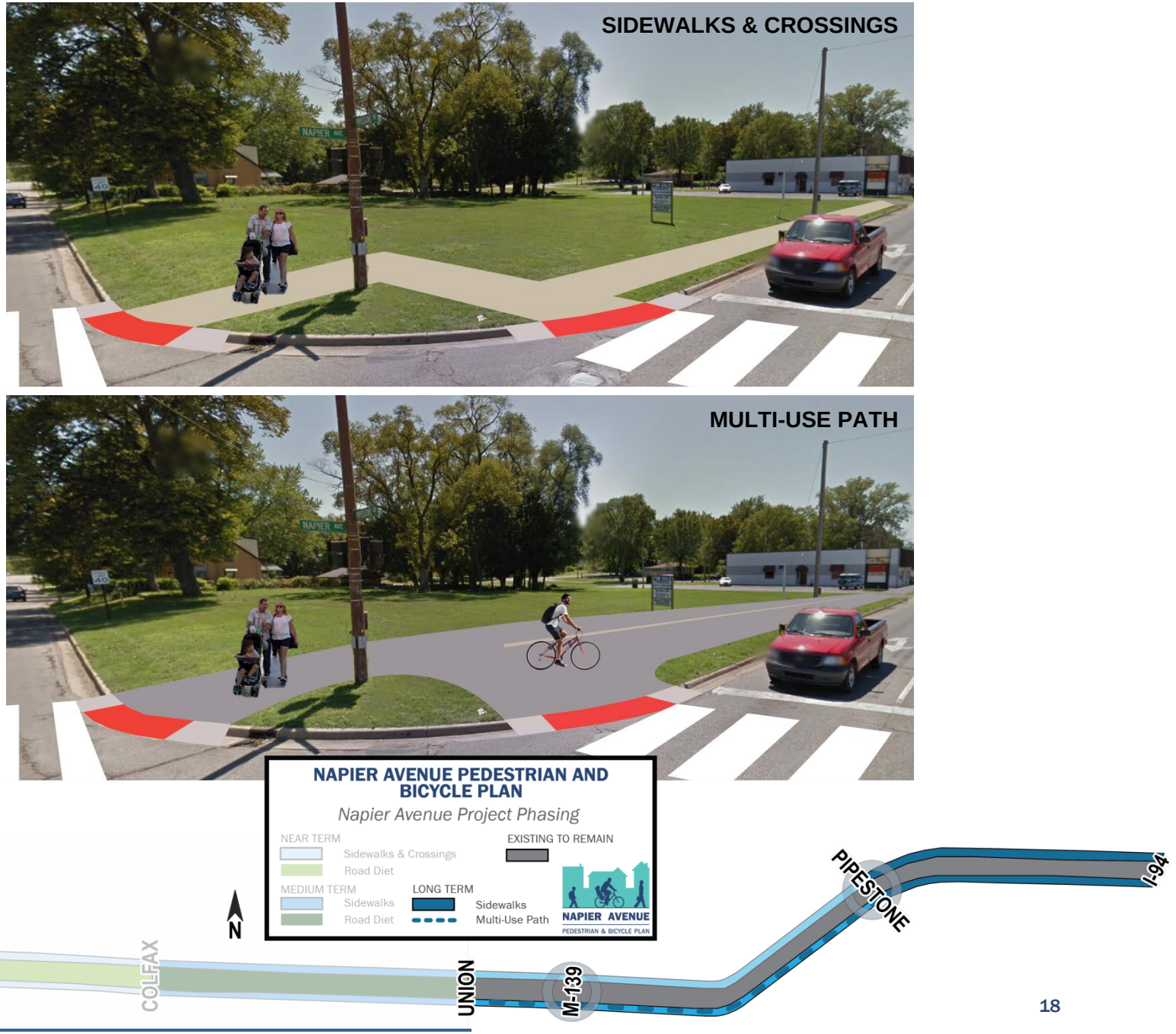


Figure 4-5: Long Term Project Phasing



4.2 Additional Design Considerations

While the project phasing presented above will achieve the improvements intended for the corridor, implementation will also open up further opportunities to improve safety and access in the Corridor and its vicinity.

Mid-Block Crossings

Pedestrian safety and access may continue to be enhanced through the installation of mid-block crossings and island refuges. The following locations are recommended:

- Between Lombard Street and the Napier Parkview Baptist Church driveway
- At the east end of Fairplain Renaissance Middle School between Colfax Avenue and Broadway
- Between Union Avenue and Milton Street
- At Plaza Drive

Access Management / Driveway Consolidation

Current driveways on Napier Avenue, especially in commercial areas such as the Colfax Avenue and the M-139 areas, are often redundant and difficult for both motorists and non-motorized users to navigate. The curb shown in Figure 4-6, for example, has practically become a driveway because cars have used it as such so frequently. Adjacent property owners may consolidate their commercial driveways using a joint driveway system to resolve such issues, coordinating with the introduction of non-motorized infrastructure to the Corridor.

The following locations are recommended for driveway consolidation:

- Shaws All Styles and Wild Rose
- Par-T Mart
- Muffler Man
- Between A-1 Maytag Laundry and Clem & Bobbies Dry Cleaners

Figure 4-6: Shaws All Styles and Wild Rose Driveway

Potential Transit Stop Locations

Adding non-motorized facilities to Napier Avenue also creates the potential for transit routing on the Corridor. Best practices for transit design are to have stops at least 1/4 mile and up to 1/2 mile apart, and preferably at or near locations where street crossings are available. As a result, potential transit stop locations include:

- Lakeland Medical Center
- Miami Road
- Lombard Street / Lyola Avenue
- Colfax Avenue
- Ogden Avenue
- Union Avenue
- M-139
- Leeds Avenue
- Pipestone Road

Napier Avenue Bridge

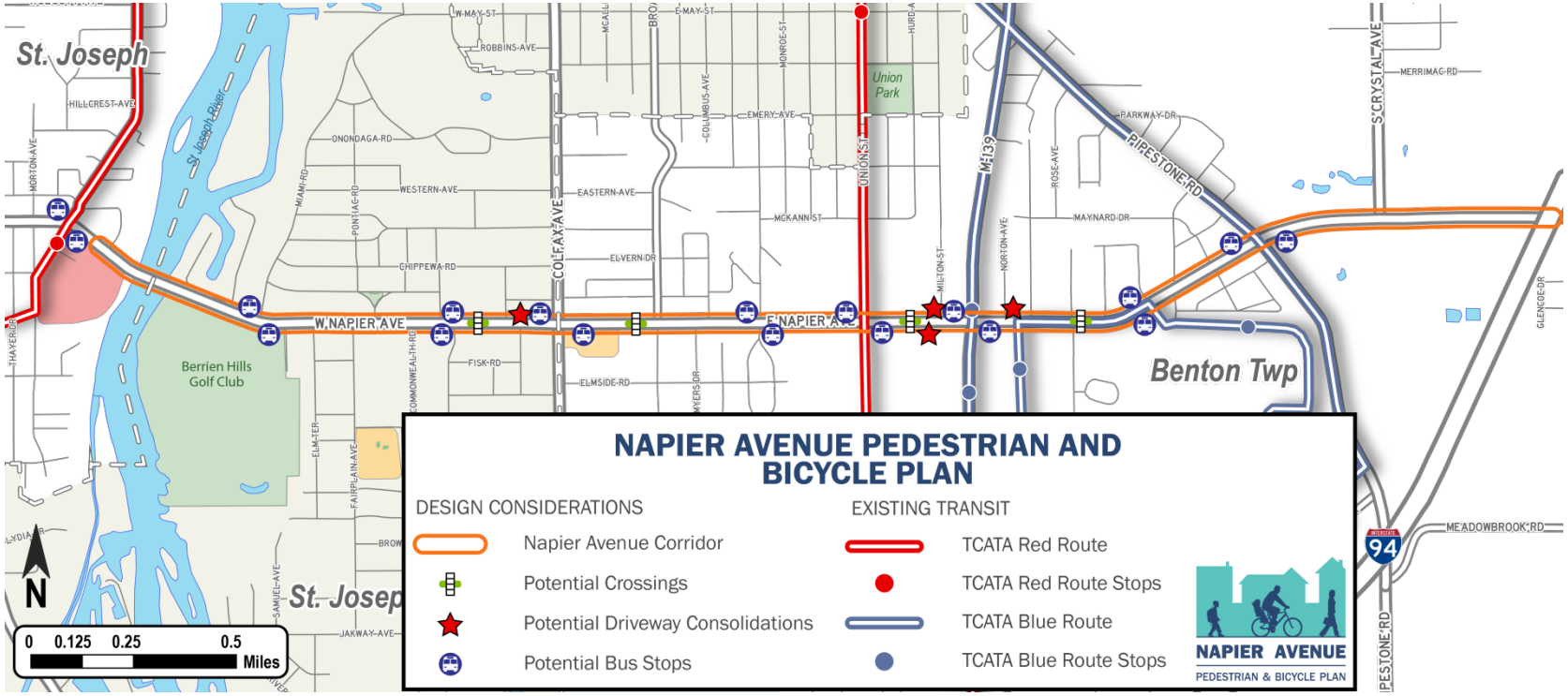
The preferred alternative limits the implementation of a lane reconfiguration to the segment of Napier Avenue between the bridge and Union Avenue, but there is potential for lanes to be rebalanced on additional segments of the Corridor in the future. The bridge over St. Joseph River currently consists of two separate decks: one for eastbound traffic and one for westbound traffic. Under these conditions, it is unfeasible to reconfigure lanes because traffic would straddle the two separate decks. However, the bridge is scheduled to be upgraded in 2021, consolidating its two decks into one. At that point, a lane reconfiguration with bike lanes may become feasible on this segment of Napier Avenue, creating potential for greater connectivity for bicyclists going to and from the City of St. Joseph. Furthermore, the east end of Napier Avenue is expected to play less of a central role in handling traffic as the US-31 freeway connection is completed, and this area is scheduled for resurfacing in 2020, opening up the opportunity for the lane rebalancing and bike lanes to be continued to the east end of the Corridor.

Future Expansion

Finally, expansion of the non-motorized network onto nearby streets and to regional trails is an important goal moving forward. Sidewalks, bike lanes, and a multi-use path on Napier Avenue will greatly improve pedestrian and bicyclist safety, comfort, and access in the Corridor itself, but many of the Corridor's cross streets limit wider connectivity with their lack of non-motorized facilities. Future efforts should continue to work towards a complete network for bicyclists and pedestrians.

Additional design considerations for Napier Avenue are shown in Figure 4-7 on the following page.

Figure 4-7: Additional Design Considerations



4.3 Funding Opportunities

There are a variety of sources that can be considered for funding the implementation of the preferred alternative for Napier Avenue, as shown in the table on the following page, with the primary option being Transportation Alternatives Program (TAP) funding.

	Federal						*State*		*Local*	
Project Element	**BUILD**	**TIFIA**	**CMAQ**	**HSIP**	**STBG**	**TA**	**SRTS**	**TAP**	**Millage**	**Public/Private Partnership**
Sidewalks	X	X	X	X	X	X	X	X	X	
Pedestrian crossings	X	X	X	X	X	X	X	X	X	
Lane rebalancing (motorized portions)	X	X		X	X				X	
Lane rebalancing (non-motorized portions)	X	X		X	X	X		X	X	
Bike lanes	X	X	X	X	X	X	X	X	X	
Multi-use path	X	X	X	X	X	X	X	X	X	X
Lighting	X	X		X	X	X	X	X	X	
Signage	X	X	X	X	X	X	X	X	X	

FEDERAL SOURCES

Better Utilizing Investments to Leverage Development (BUILD) Transportation Discretionary Grants Program

BUILD grants support roads, bridges, transit, rail, ports or intermodal transportation projects and is subject to annual appropriations.

Transportation Infrastructure Finance and Innovation Act (TIFIA)

TIFIA finances any type of project that is eligible for Federal assistance through existing surface transportation programs. It offers assistance only in the form of secured loans, loan guarantees, or standby lines of credit, but can be combined with other grant sources, and is subject to total Federal assistance limitations.

Congestion Mitigation and Air Quality (CMAQ) Program

CMAQ funding supports surface transportation projects and other related efforts that contribute air quality improvements and provide congestion relief. Projects must demonstrate emissions reduction and benefit air quality. Funding may be used for shared use paths, but may not be used for trails that are primarily for recreational use.

Highway Safety Improvement Program (HSIP)

HSIP aims to achieve a significant reduction in traffic fatalities and serious injuries on all public roads. Program funding can be used on any public road or pathway, including those owned by local governments and Tribes. Projects must be consistent with the State of Michigan's Strategic Highway Safety Plan and either (1) correct or improve a hazardous road location or feature, or (2) address a highway safety problem.

Surface Transportation Block Grant (STBG) Program

STBGs provide flexible funding that may be used by States and localities for projects to preserve and improve the conditions and performance on any Federal-aid highway, bridge and tunnel projects or on any public road, pedestrian and bicycle infrastructure, and transit capital projects.

Transportation Alternatives Set-Aside (TA – formerly Transportation Alternatives Program or TAP)

TA is a set-aside of the STBG Program specifically for transportation alternatives including all projects and activities that were previously eligible under TAP. These include pedestrian and bicycle facilities, recreational trails, safe routes to school projects, community improvements such as historic preservation and vegetation management, and environmental mitigation related to stormwater and habitat connectivity.

STATE SOURCES

Safe Routes to School (SRTS) Program Major Grant

The SRTS Major Grant helps communities build sidewalks, crosswalks, and any other infrastructure improvements that may be needed to make it possible for students to walk, bike, and roll safely to school. Up to $200,000 per school is available for infrastructure.

Transportation Alternatives Program (TAP)

TAP uses federal transportation funds designated by Congress for specific activities that enhance the intermodal transportation system and provide safe alternative transportation options.

LOCAL SOURCES

City and Township Millages

Millages may be levied by Corridor municipalities to fund specific projects located within the jurisdiction issuing the millage. Funds collected could be used for any of the project elements.

Public/Private Partnerships

Community and private foundations may play an important part in filling the gaps left by other funds. For example, the City of Big Rapids, Michigan received $400,000 of grant funding for its Riverwalk trail through corporate donations raised by Access for All, a citizen-led group to promote handicap access to the Muskegon River.

Appendix A: Sidewalks, Crossings, and Multi-Use Path Cost Estimates

The team developed a detailed cost estimate for the final recommended sidewalk and multi-use path designs of the Napier Avenue corridor, broken down by segment with the idea that it may be implemented in pieces. The estimated costs are based on costs from similar projects, and assume that relocation of private utilities and other elements within the public right-of-way would be accomplished at the cost of the owners of those assets. Resurfacing and lane re-striping costs associated with the Plan's recommended lane rebalancing designs are not included in these estimates.

	Segment 1: Miami Road Area	Segment 2: Colfax Avenue Area	Segment 3: M-139 Area	Segment 4: Pipestone Road Area	Napier Avenue Total
Construction *	$350,000	$501,000	$600,000	$315,000	$1,766,000
ROW Easements	$2,700	$52,650	$131,200	$35,000	$221,550
Property Acquisition (3%)	$10,500	$15,030	$18,000	$9,450	$52,980
Design (7%)	$24,500	$35,070	$42,000	$22,050	$123,620
Construction Inspection (8%)	$28,000	$40,080	$48,000	$25,200	$141,280
Materials Testing (3%)	$10,500	$15,030	$18,000	$9,450	$52,980
Total	**$426,200**	**$658,860**	**$857,200**	**$416,150**	**$2,358,410**

* includes 25% contingency

Appendix B: Lane Rebalancing Traffic Study Memo

AECOM
Memorandum

AECOM
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Grand Rapids, MI 49546
www.aecom.com

616 574 8500 tel
616 574 8542 fax

To: Josh Bocks Page 1

CC: Jeromie Winsor

Subject: Napier Avenue Traffic Study

From: Sayanta Barman, Kyle Reidsma

Date: 09/07/2018

1.0 INTRODUCTION

Napier Avenue in St. Joseph Charter Township and Benton Charter Township is a four-lane arterial roadway with a posted speed limit varying from 35 to 40 mph. AECOM has been asked to evaluate the possibility of converting the existing roadway to a three-lane cross section with one lane in each direction, a center left-turn lane, and bike lanes within the limits of the study area. The study area along Napier Avenue is from the St. Joseph River east to Union Avenue and includes the signalized intersections along Napier Avenue at Miami Road, Colfax Avenue, and Union Avenue.

Based on the proposed plan, the following actions were taken:

- Field survey was done of the roadway infrastructure, traffic control devices and other relevant information.
- Traffic volume data was collected at the intersections of Napier Avenue at Miami Road, Colfax Avenue, Union Avenue, and M-139 for the weekday AM and PM peak periods.
- A Synchro model was developed for the study area to perform capacity analysis for the existing and the proposed conditions.

For the purposes of the analysis, the intersection of Napier Avenue and M-139 was included in the model to understand what impacts, if any, reducing the number of lanes on Napier Avenue at Union Avenue would have on the intersection at M-139.

MDOT's Safety Program provides crash reduction factors (CRFs) for specific roadway segment and intersection improvements (https://www.michigan.gov/documents/mdot/Time_of_Return_TOR_Spreadsheet_Excel_560513_7.xls). These CRFs are based on various studies within Michigan and around the country. The roadway enhancement of a road diet (4 to 3 lane conversion) on an urban roadway results in a 30% reduction in all applicable crashes. There are also CRFs for various crash types ranging from 20-80% for when a center left-turn lane is constructed at an intersection. The non-signalized intersections along Napier Avenue would benefit from this enhancement and would likely realize the safety improvements associated with these CRFs. There have also been numerous studies around the United States regarding road

diets and the associated safety benefits. The Federal Highway Association's (FHWA) "Road Diet Information Guide" (2014) cites potential overall crash reductions of 19 to 47 percent based on various studies for road diets installed on four-lane roadways. Safety is achieved through reducing the number of conflict points as well as providing improved sight-distance for left-turning vehicles on a three-lane roadway compared to the four-lane undivided roadway.

2.0 DATA COLLECTION

Turning movement counts were collected on Thursday, July 19, 2018 at the signalized intersections along Napier Avenue at Miami Road, Colfax Avenue, Union Avenue, and M-139. Data was collected from 7-9 AM and 2-6 PM.

The existing (2018) turning movement count reports are included in **Appendix A**. The three traffic signals along Napier Avenue at the intersections of Colfax Avenue, Union Street, and M-139 operate with four-phase signal operations. The traffic signal at Napier Avenue/M-139 operates with a northbound-southbound leading protected-only left-turn phase, a northbound-southbound through phase, an eastbound-westbound leading protected-only left-turn phase, and an eastbound-westbound through phase. The two traffic signals along Napier Avenue at Colfax Avenue and Union Street both operate with an eastbound-westbound through phase, an eastbound-westbound lagging protected-only left-turn phase, a northbound-southbound through phase, and a northbound-southbound lagging protected-only left-turn phase.

The traffic signal at Napier Avenue/Miami Road is currently controlled by a 3-phase signal. The analysis at the Napier Avenue/Miami Road intersection included phasing changes that the Road Commission is planning to implement later in 2018. The signal will operate with an eastbound-westbound through phase, an eastbound-westbound lagging protected-only left-turn phase, and a northbound-southbound phase.

AECOM field-verified existing geometric information in order to document existing traffic operational conditions at the intersections, and on the segment of Napier Avenue where the proposed lane configuration modification would take place.

Traffic volumes fluctuate with the different seasons as well as with different days of the week. Seasonal and day of week adjustment factors can be used to remove these biases for calculating Average Annual Daily Traffic (AADT) from a small sample size traffic count. MDOT publishes seasonal and day of week adjustment factors to adjust the traffic volume collected on a particular type of roadway. The seasonal factors supplied in the "Napier Avenue Pedestrian & Bicycle Plan Traffic Analysis Memo" are shown in **Table 1**. The appropriate seasonal factor in this scenario is 0.883 as the traffic volumes were collected on Thursday, July 19, 2018 for this study. For conservative purposes, the capacity analysis along Napier Avenue for this study was performed without utilizing the seasonal adjustment factor on the volumes since it was less than 1.0.

TABLE 1. SEASONAL ADJUSTMENT FACTORS

Seasonal Factors								
Group	URBAN							
From Year:	2016	To Year:	2016					
	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Month
Jan	1.788	1.091	1.052	1.016	0.986	1.055	1.345	1.19
Feb	1.544	0.994	0.984	1.021	1.014	0.917	1.217	1.099
Mar	1.447	0.964	0.979	0.951	0.93	0.891	1.193	1.051
Apr	1.502	0.956	0.924	0.926	0.91	0.871	1.19	1.04
May	1.37	1.004	0.912	0.902	0.881	0.852	0.145	1.009
Jun	1.332	0.924	0.902	0.891	0.876	0.848	1.109	0.983
Jul	1.366	1.033	0.916	0.899	0.883	0.864	1.165	1.018
Aug	1.312	0.914	0.905	0.884	0.872	0.85	1.157	0.985
Sep	1.369	1.025	0.912	0.909	0.893	0.855	1.171	1.019
Oct	1.372	0.929	0.899	0.897	0.883	0.836	1.134	0.993
Nov	1.434	0.933	0.91	0.904	0.973	0.919	1.211	1.041
Dec	1.774	1.092	0.962	0.946	0.943	0.93	1.321	1.138

3.0 LEVEL OF SERVICE ANALYSIS

In order to quantify intersection traffic operations at the four study area intersections, existing "Level-of-Service" (LOS) values were determined using the industry-standard package, *Highway Capacity Software 2000*.

The Highway Capacity Manual (HCM) considers the average delay per vehicle as the primary measure for assessing the performance of traffic at signalized intersections. Delay is defined as the difference between actual travel time and ideal travel time if no traffic signal is present. Delays may be qualitatively described in terms of "Level of Service" (LOS) provided by the intersection. The term "Level of Service" (LOS) indicates how well (or poorly) traffic operates based on traffic volumes, lane configurations, and traffic controls. Each level is determined by the average amount of traffic control delay experienced by motorists. LOS "A" represents little or no delays while LOS "F" represents operational failure (extensive delays which may include long vehicular queues). LOS "D" or better is typically considered acceptable during peak hours for urban communities like St. Joseph Charter Township and Benton Harbor Charter Township. The Level-of-Service criteria, as defined by the HCM, are described in **Table 2** for signalized and unsignalized intersections.

TABLE 2
PEAK-HOUR LEVEL-OF-SERVICE RANGES
HIGHWAY CAPACITY MANUAL (2000)

Level-of-Service	Signalized Intersections	Unsignalized Intersections
	Control Delay (sec/veh)	Control Delay (sec/veh)
A	⩽10	⩽10
B	10 – 20	10 – 15
C	20 – 35	15 – 25
D	35 – 55	25 – 35
E	55 – 80	35 – 50
F	>80	>50

Source: 2000 Highway Capacity Manual

A delay and LOS analysis was performed for the Napier Avenue study area using Trafficware's *Synchro Version 9* software. The operational analysis covers the weekday AM peak period and the weekday PM peak period. It is important to note the LOS analysis was performed on the basis of the peak hour data collected.

Optimization of signal timings at the intersection of Napier Avenue and Colfax Avenue was completed for the proposed conditions. In the morning peak hour, two seconds of green time was shifted to the eastbound-westbound left-turn movement from the eastbound-westbound through movement. In the afternoon peak hour, one second of green time was shifted to the eastbound-westbound through movement from the northbound-southbound left-turn movement. The traffic signal timings were kept same as the existing scenario for the other three intersections for the morning and afternoon peak-hour capacity analysis.

The Napier/Colfax intersection was also modified to include an exclusive eastbound right-turn lane due to the volume of right-turning traffic (207 vehicles) in the afternoon peak hour. With a shared thru/right lane, the proposed delay and LOS was not acceptable. The addition of the right-turn lane with 100' of storage allows for acceptable delay and LOS values. The signing and striping of the bike lane and roadway on this approach to the intersection will need to be designed in such a way that bike traffic is mixed with right-turning vehicles in the space for the right-turn lane. The National Association of City Transportation Officials' (NACTO) Urban Bikeway Design Guide (2014, 2nd edition) provides recommendations and examples for how this can be done in a shared space.

Tables 3 – 10 show a detailed breakdown of the delay and LOS analysis performed for the existing volumes on the existing (four-lane cross-section) and the proposed (three-lane cross-section) conditions along Napier Avenue. The delay and LOS for each approach and movement is also included.

Table 3: LOS for Weekday AM Peak Hour at Napier Avenue and Miami Road

Approach	Movement	Existing Condition		Proposed Condition	
		Delay	LOS	Delay	LOS
Northbound Miami	Left, Thru and Right	31.2	C	31.2	C
	Approach	31.2	C	31.2	C
Southbound Miami	Left and Thru	31.7	C	31.7	C
	Right	36.6	D	37	D
	Approach	36.1	D	36.4	D
Eastbound Napier	Left	37.5	D	37.5	D
	Thru and Right	3.2	A	4	A
	Approach	6.3	A	7	A
Westbound Napier	Left	-	-	-	-
	Thru and Right	11.6	B	17.9	B
	Approach	11.6	B	17.9	B

Table 4: LOS for Weekday AM Peak Hour at Napier Avenue and Colfax Avenue

Approach	Movement	Existing Condition		Proposed Condition	
		Delay	LOS	Delay	LOS
Northbound Colfax	Left	29	C	29.1	C
	Thru and Right	26	C	25.9	C
	Approach	27.5	C	27.5	C
Southbound Colfax	Left	33.6	C	33.5	C
	Thru and Right	34.2	C	34.2	C
	Approach	34	C	34	C
Eastbound Napier	Left	33.6	C	32.5	C
	Thru	16.6	B	22.4	C
	Right	-	-	19.4	B
	Approach	18	B	22.5	C
Westbound Napier	Left	57.1	E	54.2	D
	Thru and Right	24	C	35.5	D
	Approach	26.7	C	37	D

Table 5: LOS for Weekday AM Peak Hour at Napier Avenue and Union Avenue

Approach	Movement	Existing Condition		Proposed Condition	
		Delay	LOS	Delay	LOS
Northbound Union	Left	36.7	D	36.9	D
	Thru and Right	34.7	C	34.8	C
	Approach	35.5	D	35.7	D
Southbound Union	Left	38.8	D	39.6	D
	Thru and Right	37.2	D	37.7	D
	Approach	38	D	38.6	D
Eastbound Napier	Left	42.3	D	38.7	D
	Thru and Right	5.5	A	4.5	A
	Approach	6	A	5	A
Westbound Napier	Left	34.8	C	39.2	D
	Thru and Right	9.3	A	9.4	A
	Approach	11.3	B	11.6	B

Table 6: LOS for Weekday AM Peak Hour at Napier Avenue and M-139

Approach	Movement	Existing Condition		Proposed Condition	
		Delay	LOS	Delay	LOS
Northbound M-139	Left	46	D	37.8	D
	Thru	17.2	B	16.9	B
	Right	16.1	B	15.8	B
	Approach	23.8	C	21.7	C
Southbound M-139	Left	40.4	D	41.2	D
	Thru	19.3	B	20.5	C
	Right	18.9	B	20.1	C
	Approach	21.9	C	23.1	C
Eastbound Napier	Left	39.6	D	41	D
	Thru	31.6	C	32.8	C
	Right	31.3	C	32.5	C
	Approach	32.9	C	34.2	C
Westbound Napier	Left	38.5	D	39.2	D
	Thru	32.4	C	33.3	C
	Right	30.2	C	31.3	C
	Approach	33.1	C	34	C

Table 7: LOS for Weekday PM Peak Hour at Napier Avenue and Miami Road

Approach	Movement	Existing Condition		Proposed Condition	
		Delay	LOS	Delay	LOS
Northbound Miami	Left, Thru and Right	33	C	33	C
	Approach	33	C	33	C
Southbound Miami	Left and Thru	34.5	C	34.5	C
	Right	49.6	D	50.2	D
	Approach	46.9	D	47.3	D
Eastbound Napier	Left	37.1	D	37.1	D
	Thru and Right	8	A	14.8	B
	Approach	10.1	B	16.4	B
Westbound Napier	Left	24.7	C	37.3	D
	Thru and Right	12.2	B	19.5	B
	Approach	12.4	B	19.8	B

Table 8: LOS for Weekday PM Peak Hour at Napier Avenue and Colfax Avenue

Approach	Movement	Existing Condition		Proposed Condition	
		Delay	LOS	Delay	LOS
Northbound Colfax	Left	44.2	D	46.4	D
	Thru and Right	38.8	D	38.8	D
	Approach	41.8	D	43.1	D
Southbound Colfax	Left	35.8	D	36.4	D
	Thru and Right	39	D	39	D
	Approach	37.8	D	38.1	D
Eastbound Napier	Left	32.3	C	30.8	C
	Thru	14.9	B	22.4	C
	Right	-	-	18	B
	Approach	16.3	B	21.8	C
Westbound Napier	Left	**60.7**	**E**	**61.5**	**E**
	Thru and Right	24.3	C	37.3	D
	Approach	26.9	C	39	D

Table 9: LOS for Weekday PM Peak Hour at Napier Avenue and Union Avenue

Approach	Movement	Existing Condition		Proposed Condition	
		Delay	LOS	Delay	LOS
Northbound Union	Left	42.2	D	42.2	D
	Thru and Right	37.5	D	37.5	D
	Approach	38.8	D	38.8	D
Southbound Union	Left	42.6	D	42.6	D
	Thru and Right	35.9	D	35.9	D
	Approach	39.2	D	39.2	D
Eastbound Napier	Left	**55.6**	**E**	53.6	D
	Thru and Right	18.2	B	35.2	D
	Approach	19.1	B	35.6	D
Westbound Napier	Left	41.2	D	41.2	D
	Thru and Right	14.2	B	14.2	B
	Approach	17	B	17	B

Table 10: LOS for Weekday PM Peak Hour at Napier Avenue and M-139

Approach	Movement	Existing Condition		Proposed Condition	
		Delay	LOS	Delay	LOS
Northbound M-139	Left	50.1	D	50.1	D
	Thru	26.8	C	26.8	C
	Right	24.6	C	24.6	C
	Approach	34.8	C	34.8	C
Southbound M-139	Left	46.6	D	46.6	D
	Thru	35.6	D	35.6	D
	Right	34.7	C	34.7	C
	Approach	37.2	D	37.2	D
Eastbound Napier	Left	46.6	D	46.6	D
	Thru	41.9	D	41.9	D
	Right	45.1	D	45.1	D
	Approach	43.3	D	43.3	D
Westbound Napier	Left	46.2	D	46.2	D
	Thru	38.3	D	38.3	D
	Right	35.1	D	35.1	D
	Approach	39.2	D	39.2	D

4.0 CONCLUSIONS

Based on the analyses performed as part of this study, the following conclusions are made:

1. MDOT and the FHWA provide information based on various studies that document safety benefits associated with converting a four-lane roadway to a three-lane roadway in what is referred to as a “road diet”.

2. The modification in the lane configuration along Napier Avenue from Miami Street to Union Avenue to a three-lane cross section with one lane in each direction and a center left-turn lane is expected to have little or no additional impact on traffic operations in either direction.
3. Optimization of signal timings at the intersection of Napier Avenue and Colfax Avenue was completed for the proposed conditions. In the morning peak hour, two seconds of green time was shifted to the eastbound-westbound left-turn movement from the eastbound-westbound through movement. In the afternoon peak hour, one second of green time was shifted to the eastbound-westbound through movement from the northbound-southbound left-turn movement. The traffic signal timings were kept same as the existing scenario for the other three intersections for the morning and afternoon peak-hour capacity analysis.
4. An exclusive right-turn lane for eastbound Napier Avenue traffic should be included at the Napier/Colfax intersection to accommodate the afternoon peak hour right-turn traffic. Signing and striping design for the shared bike/right-turn lane should follow NACTO recommendations.
5. All movements at the study intersections are projected to operate at an acceptable level of service ("D" or better) in both the morning and afternoon peak-hour under proposed conditions, except for the westbound left-turn movement at Napier Avenue/Colfax Avenue during the afternoon peak hour. This movement showing level of service "E" is not specifically due to the proposed road diet, as it is also LOS E in the existing scenario. The westbound left turn movement at this intersection has relatively low volume (41 vehicles in the PM).
6. The implementation of the road diet along Napier Avenue from Miami Street to Union Avenue could be phased over two years. In the first year, the road diet could be implemented from Miami Street to Colfax Avenue, and in the second year it could be implemented from Colfax Avenue to Union Avenue. However, in the interim condition after year one, the rightmost through lane for westbound traffic at Colfax Avenue would need to be converted from a shared through/right turn lane into a dedicated right turn lane. This would be achieved by modifying the pavement markings and adding suitable lane assignment signs for westbound traffic at Colfax Avenue. We do not anticipate any capacity concerns with this interim lane configuration.

Appendix A
Traffic Count Data

AECOM Corp
3950 Sparks Drive SE

Grand Rapids, Michigan, United States 49546
(616) 574-8500

Count Name: Napier Ave @ Miami Rd
Site Code:
Start Date: 07/19/2018

Turning Movement Data

Start Time	Napier Ave Eastbound					Napier Ave Westbound					Berrien Hills Golf Club Driveway Northbound					Miami Rd Southbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
7:00 AM	5	54	0	0	59	1	59	3	0	63	1	0	0	0	1	1	0	3	0	4	127
7:15 AM	7	69	1	0	77	0	80	6	0	86	0	0	0	0	0	2	0	9	1	11	174
7:30 AM	2	75	0	1	77	0	129	4	0	133	1	0	0	0	1	4	0	18	0	22	233
7:45 AM	13	98	0	0	111	0	178	8	0	186	0	0	0	0	0	1	0	15	0	16	313
Hourly Total	27	296	1	1	324	1	446	21	0	468	2	0	0	0	2	8	0	45	1	53	847
8:00 AM	9	94	1	0	104	0	131	4	0	135	0	0	0	0	0	1	0	17	0	18	257
8:15 AM	11	84	0	0	95	0	117	5	0	122	0	0	0	1	0	2	0	17	0	19	236
8:30 AM	6	93	0	0	99	1	107	3	0	111	1	0	0	0	1	5	0	16	0	21	232
8:45 AM	5	84	3	0	92	0	98	5	0	103	0	0	0	0	0	2	0	4	0	6	201
Hourly Total	31	355	4	0	390	1	453	17	0	471	1	0	0	1	1	10	0	54	0	64	926
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:00 PM	6	164	2	0	172	0	118	1	0	119	2	1	0	0	3	3	1	12	0	16	310
2:15 PM	9	140	3	0	152	1	135	2	0	138	1	0	1	0	2	3	0	22	0	25	317
2:30 PM	14	185	4	0	203	1	133	5	0	139	1	0	0	0	1	4	0	17	0	21	364
2:45 PM	14	164	5	0	183	0	165	5	0	170	2	0	1	0	3	2	0	17	0	19	375
Hourly Total	43	653	14	0	710	2	551	13	0	566	6	1	2	0	9	12	1	68	0	81	1366
3:00 PM	4	199	4	0	207	1	118	4	0	123	1	0	1	1	2	3	0	12	0	15	347
3:15 PM	20	227	6	0	253	3	136	5	0	144	1	0	1	0	2	3	0	23	1	26	425
3:30 PM	19	216	7	1	242	1	122	3	0	126	3	0	0	0	3	4	1	22	0	27	398
3:45 PM	16	188	7	0	211	2	158	3	0	163	1	1	1	0	3	4	0	23	0	27	404
Hourly Total	59	830	24	1	913	7	534	15	0	556	6	1	3	1	10	14	1	80	1	95	1574
4:00 PM	15	189	3	0	207	1	139	2	0	142	2	0	0	0	2	7	0	19	0	26	377
4:15 PM	22	214	2	0	238	5	149	5	0	159	1	0	1	0	2	1	0	18	0	19	418
4:30 PM	14	196	9	0	219	3	140	3	0	146	1	0	1	0	2	5	2	20	0	27	394
4:45 PM	14	176	7	0	197	1	149	9	0	159	3	0	1	1	4	4	0	22	0	26	386
Hourly Total	65	775	21	0	861	10	577	19	0	606	7	0	3	1	10	17	2	79	0	98	1575
5:00 PM	14	222	2	1	238	2	157	6	0	165	2	0	2	0	4	9	0	33	0	42	449
5:15 PM	24	209	1	0	234	0	148	4	0	152	2	1	0	0	3	1	0	17	0	18	407
5:30 PM	14	142	2	0	158	0	138	5	0	143	1	2	0	0	3	8	0	12	1	20	324
5:45 PM	10	140	5	2	155	0	138	3	0	141	3	1	1	0	5	4	0	16	0	20	321
Hourly Total	62	713	10	3	785	2	581	18	0	601	8	4	3	0	15	22	0	78	1	100	1501
6:00 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
Grand Total	287	3622	74	5	3983	23	3143	103	0	3269	30	6	11	3	47	83	4	404	3	491	7790
Approach %	7.2	90.9	1.9	-	-	0.7	96.1	3.2	-	-	63.8	12.8	23.4	-	-	16.9	0.8	82.3	-	-	-
Total %	3.7	46.5	0.9	-	51.1	0.3	40.3	1.3	-	42.0	0.4	0.1	0.1	-	0.6	1.1	0.1	5.2	-	6.3	-
Lights	284	3567	74	-	3925	23	3100	103	-	3226	30	6	11	-	47	82	4	400	-	486	7684
% Lights	99.0	98.5	100.0	-	98.5	100.0	98.6	100.0	-	98.7	100.0	100.0	100.0	-	100.0	98.8	100.0	99.0	-	99.0	98.6
Buses	2	16	0	-	18	0	10	0	-	10	0	0	0	-	0	0	0	2	-	2	30
% Buses	0.7	0.4	0.0	-	0.5	0.0	0.3	0.0	-	0.3	0.0	0.0	0.0	-	0.0	0.0	0.0	0.5	-	0.4	0.4
Trucks	1	39	0	-	40	0	33	0	-	33	0	0	0	-	0	1	0	2	-	3	76
% Trucks	0.3	1.1	0.0	-	1.0	0.0	1.0	0.0	-	1.0	0.0	0.0	0.0	-	0.0	1.2	0.0	0.5	-	0.6	1.0
Bicycles on Crosswalk	-	-	-	3	-	-	-	-	0	-	-	-	-	0	-	-	-	-	2	-	-
% Bicycles on Crosswalk	-	-	-	60.0	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	66.7	-	-
Pedestrians	-	-	-	2	-	-	-	-	0	-	-	-	-	3	-	-	-	-	1	-	-
% Pedestrians	-	-	-	40.0	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	33.3	-	-

AECOM Corp
3950 Sparks Drive SE

Grand Rapids, Michigan, United States 49546
(616) 574-8500

Count Name: Napier Ave @ Miami Rd
Site Code:
Start Date: 07/19/2018

Turning Movement Peak Hour Data (7:30 AM)

Start Time	Napier Ave Eastbound					Napier Ave Westbound					Berrien Hills Golf Club Driveway Northbound					Miami Rd Southbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
7:30 AM	2	75	0	1	77	0	129	4	0	133	1	0	0	0	1	4	0	18	0	22	233
7:45 AM	13	98	0	0	111	0	178	8	0	186	0	0	0	0	0	1	0	15	0	16	313
8:00 AM	9	94	1	0	104	0	131	4	0	135	0	0	0	0	0	1	0	17	0	18	257
8:15 AM	11	84	0	0	95	0	117	5	0	122	0	0	0	1	0	2	0	17	0	19	236
Total	35	351	1	1	387	0	555	21	0	576	1	0	0	1	1	8	0	67	0	75	1039
Approach %	9.0	90.7	0.3	-	-	0.0	96.4	3.6	-	-	100.0	0.0	0.0	-	-	10.7	0.0	89.3	-	-	-
Total %	3.4	33.8	0.1	-	37.2	0.0	53.4	2.0	-	55.4	0.1	0.0	0.0	-	0.1	0.8	0.0	6.4	-	7.2	-
PHF	0.673	0.895	0.250	-	0.872	0.000	0.779	0.656	-	0.774	0.250	0.000	0.000	-	0.250	0.500	0.000	0.931	-	0.852	0.830
Lights	35	344	1	-	380	0	540	21	-	561	1	0	0	-	1	8	0	66	-	74	1016
% Lights	100.0	98.0	100.0	-	98.2	-	97.3	100.0	-	97.4	100.0	-	-	-	100.0	100.0	-	98.5	-	98.7	97.8
Buses	0	3	0	-	3	0	4	0	-	4	0	0	0	-	0	0	0	1	-	1	8
% Buses	0.0	0.9	0.0	-	0.8	-	0.7	0.0	-	0.7	0.0	-	-	-	0.0	0.0	-	1.5	-	1.3	0.8
Trucks	0	4	0	-	4	0	11	0	-	11	0	0	0	-	0	0	0	0	-	0	15
% Trucks	0.0	1.1	0.0	-	1.0	-	2.0	0.0	-	1.9	0.0	-	-	-	0.0	0.0	-	0.0	-	0.0	1.4
Bicycles on Crosswalk	-	-	-	1	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	100.0	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	1	-	-	-	-	0	-	-
% Pedestrians	-	-	-	0.0	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	-	-

Turning Movement Peak Hour Data (4:15 PM)

Start Time	Napier Ave Eastbound					Napier Ave Westbound					Berrien Hills Golf Club Driveway Northbound					Miami Rd Southbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
4:15 PM	22	214	2	0	238	5	149	5	0	159	1	0	1	0	2	1	0	18	0	19	418
4:30 PM	14	196	9	0	219	3	140	3	0	146	1	0	1	0	2	5	2	20	0	27	394
4:45 PM	14	176	7	0	197	1	149	9	0	159	3	0	1	1	4	4	0	22	0	26	386
5:00 PM	14	222	2	1	238	2	157	6	0	165	2	0	2	0	4	9	0	33	0	42	449
Total	64	808	20	1	892	11	595	23	0	629	7	0	5	1	12	19	2	93	0	114	1647
Approach %	7.2	90.6	2.2	-	-	1.7	94.6	3.7	-	-	58.3	0.0	41.7	-	-	16.7	1.8	81.6	-	-	-
Total %	3.9	49.1	1.2	-	54.2	0.7	36.1	1.4	-	38.2	0.4	0.0	0.3	-	0.7	1.2	0.1	5.6	-	6.9	-
PHF	0.727	0.910	0.556	-	0.937	0.550	0.947	0.639	-	0.953	0.583	0.000	0.625	-	0.750	0.528	0.250	0.705	-	0.679	0.917
Lights	64	797	20	-	881	11	593	23	-	627	7	0	5	-	12	19	2	92	-	113	1633
% Lights	100.0	98.6	100.0	-	98.8	100.0	99.7	100.0	-	99.7	100.0	-	100.0	-	100.0	100.0	100.0	98.9	-	99.1	99.1
Buses	0	3	0	-	3	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	3
% Buses	0.0	0.4	0.0	-	0.3	0.0	0.0	0.0	-	0.0	0.0	-	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.2
Trucks	0	8	0	-	8	0	2	0	-	2	0	0	0	-	0	0	0	1	-	1	11
% Trucks	0.0	1.0	0.0	-	0.9	0.0	0.3	0.0	-	0.3	0.0	-	0.0	-	0.0	0.0	0.0	1.1	-	0.9	0.7
Bicycles on Crosswalk	-	-	-	1	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	100.0	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	1	-	-	-	-	0	-	-
% Pedestrians	-	-	-	0.0	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	-	-

AECOM Corp
3950 Sparks Drive SE

Grand Rapids, Michigan, United States 49546
(616) 574-8500

Count Name: Napier Ave @ Colfax Ave
Site Code:
Start Date: 07/19/2018

Turning Movement Data

Start Time	Napier Ave Eastbound					Napier Ave Westbound					Colfax Ave Northbound					Colfax Ave Southbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
7:00 AM	6	37	12	0	55	2	33	8	0	43	24	13	2	0	39	3	12	6	0	21	158
7:15 AM	7	41	29	0	77	2	41	7	0	50	30	24	3	0	57	7	15	4	0	26	210
7:30 AM	6	51	24	1	81	1	45	9	0	55	57	27	1	0	85	9	22	9	0	40	261
7:45 AM	10	65	23	0	98	7	70	19	0	96	54	71	2	0	127	10	20	11	0	41	362
Hourly Total	29	194	88	1	311	12	189	43	0	244	165	135	8	0	308	29	69	30	0	128	991
8:00 AM	6	70	23	0	99	6	74	13	0	93	46	42	1	0	89	10	17	10	0	37	318
8:15 AM	9	61	24	0	94	5	59	10	0	74	39	27	2	0	68	9	13	8	0	30	266
8:30 AM	8	61	31	0	100	10	62	15	0	87	29	22	4	0	55	14	21	9	0	44	286
8:45 AM	7	57	27	0	91	6	68	17	1	91	33	21	7	0	61	17	22	5	0	44	287
Hourly Total	30	249	105	0	384	27	263	55	1	345	147	112	14	0	273	50	73	32	0	155	1157
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2:00 PM	16	107	34	0	157	3	79	18	1	100	32	19	8	1	59	27	21	15	0	63	379
2:15 PM	16	119	27	0	162	8	100	20	1	128	31	24	4	1	59	15	18	14	0	47	396
2:30 PM	17	128	36	0	181	10	103	22	0	135	31	20	10	0	61	28	35	15	0	78	455
2:45 PM	12	116	32	0	160	8	93	22	0	123	50	18	7	0	75	22	27	10	0	59	417
Hourly Total	61	470	129	0	660	29	375	82	2	486	144	81	29	2	254	92	101	54	0	247	1647
3:00 PM	23	127	41	0	191	4	87	29	0	120	28	10	7	0	45	17	27	10	0	54	410
3:15 PM	23	140	42	1	205	8	102	14	0	124	31	23	12	1	66	26	22	13	0	61	456
3:30 PM	21	147	53	0	221	12	93	21	0	126	34	17	10	1	61	25	26	13	0	64	472
3:45 PM	14	140	34	0	188	5	107	26	0	138	44	15	6	0	65	21	30	9	0	60	451
Hourly Total	81	554	170	1	805	29	389	90	0	508	137	65	35	2	237	89	105	45	0	239	1789
4:00 PM	17	129	41	0	187	10	101	19	0	130	42	14	9	0	65	21	44	10	0	75	457
4:15 PM	18	136	59	0	213	5	108	19	0	132	35	25	7	0	67	22	34	20	0	76	488
4:30 PM	11	112	50	0	173	6	96	39	0	141	48	24	11	0	83	35	29	11	0	75	472
4:45 PM	15	114	47	0	176	10	114	22	0	146	39	22	14	0	75	24	31	17	0	72	469
Hourly Total	61	491	197	0	749	31	419	99	0	549	164	85	41	0	290	102	138	58	0	298	1886
5:00 PM	14	135	60	0	209	16	117	15	0	148	41	29	6	1	76	32	34	27	0	93	526
5:15 PM	19	128	50	0	197	9	101	26	0	136	47	26	6	0	79	27	46	18	1	91	503
5:30 PM	14	104	37	0	155	8	88	18	0	114	45	18	14	0	77	21	31	11	0	63	409
5:45 PM	11	99	30	0	140	8	105	23	0	136	31	33	11	0	75	20	31	14	0	65	416
Hourly Total	58	466	177	0	701	41	411	82	0	534	164	106	37	1	307	100	142	70	1	312	1854
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	320	2424	866	2	3610	169	2046	451	3	2666	921	584	164	5	1669	462	628	289	1	1379	9324
Approach %	8.9	67.1	24.0	-	-	6.3	76.7	16.9	-	-	55.2	35.0	9.8	-	-	33.5	45.5	21.0	-	-	-
Total %	3.4	26.0	9.3	-	38.7	1.8	21.9	4.8	-	28.6	9.9	6.3	1.8	-	17.9	5.0	6.7	3.1	-	14.8	-
Lights	315	2388	856	-	3559	163	2012	439	-	2614	914	566	157	-	1637	451	612	286	-	1349	9159
% Lights	98.4	98.5	98.8	-	98.6	96.4	98.3	97.3	-	98.0	99.2	96.9	95.7	-	98.1	97.6	97.5	99.0	-	97.8	98.2
Buses	2	6	6	-	14	5	8	6	-	19	1	8	4	-	13	3	5	0	-	8	54
% Buses	0.6	0.2	0.7	-	0.4	3.0	0.4	1.3	-	0.7	0.1	1.4	2.4	-	0.8	0.6	0.8	0.0	-	0.6	0.6
Trucks	3	30	4	-	37	1	26	6	-	33	6	10	3	-	19	8	11	3	-	22	111
% Trucks	0.9	1.2	0.5	-	1.0	0.6	1.3	1.3	-	1.2	0.7	1.7	1.8	-	1.1	1.7	1.8	1.0	-	1.6	1.2
Bicycles on Crosswalk	-	-	-	2	-	-	-	-	1	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	100.0	-	-	-	-	33.3	-	-	-	-	0.0	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	0	-	-	-	-	2	-	-	-	-	5	-	-	-	-	1	-	-
% Pedestrians	-	-	-	0.0	-	-	-	-	66.7	-	-	-	-	100.0	-	-	-	-	100.0	-	-

AECOM Corp
3950 Sparks Drive SE

Grand Rapids, Michigan, United States 49546
(616) 574-8500

Count Name: Napier Ave @ Colfax Ave
Site Code:
Start Date: 07/19/2018

Turning Movement Peak Hour Data (7:45 AM)

Start Time	Napier Ave Eastbound					Napier Ave Westbound					Colfax Ave Northbound					Colfax Ave Southbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
7:45 AM	10	65	23	0	98	7	70	19	0	96	54	71	2	0	127	10	20	11	0	41	362
8:00 AM	6	70	23	0	99	6	74	13	0	93	46	42	1	0	89	10	17	10	0	37	318
8:15 AM	9	61	24	0	94	5	59	10	0	74	39	27	2	0	68	9	13	8	0	30	266
8:30 AM	8	61	31	0	100	10	62	15	0	87	29	22	4	0	55	14	21	9	0	44	286
Total	33	257	101	0	391	28	265	57	0	350	168	162	9	0	339	43	71	38	0	152	1232
Approach %	8.4	65.7	25.8	-	-	8.0	75.7	16.3	-	-	49.6	47.8	2.7	-	-	28.3	46.7	25.0	-	-	-
Total %	2.7	20.9	8.2	-	31.7	2.3	21.5	4.6	-	28.4	13.6	13.1	0.7	-	27.5	3.5	5.8	3.1	-	12.3	-
PHF	0.825	0.918	0.815	-	0.978	0.700	0.895	0.750	-	0.911	0.778	0.570	0.563	-	0.667	0.768	0.845	0.864	-	0.864	0.851
Lights	31	249	100	-	380	27	253	56	-	336	165	157	9	-	331	42	69	38	-	149	1196
% Lights	93.9	96.9	99.0	-	97.2	96.4	95.5	98.2	-	96.0	98.2	96.9	100.0	-	97.6	97.7	97.2	100.0	-	98.0	97.1
Buses	1	3	1	-	5	0	3	1	-	4	1	1	0	-	2	1	1	0	-	2	13
% Buses	3.0	1.2	1.0	-	1.3	0.0	1.1	1.8	-	1.1	0.6	0.6	0.0	-	0.6	2.3	1.4	0.0	-	1.3	1.1
Trucks	1	5	0	-	6	1	9	0	-	10	2	4	0	-	6	0	1	0	-	1	23
% Trucks	3.0	1.9	0.0	-	1.5	3.6	3.4	0.0	-	2.9	1.2	2.5	0.0	-	1.8	0.0	1.4	0.0	-	0.7	1.9
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Turning Movement Peak Hour Data (4:30 PM)

Start Time	Napier Ave Eastbound					Napier Ave Westbound					Colfax Ave Northbound					Colfax Ave Southbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
4:30 PM	11	112	50	0	173	6	96	39	0	141	48	24	11	0	83	35	29	11	0	75	472
4:45 PM	15	114	47	0	176	10	114	22	0	146	39	22	14	0	75	24	31	17	0	72	469
5:00 PM	14	135	60	0	209	16	117	15	0	148	41	29	6	1	76	32	34	27	0	93	526
5:15 PM	19	128	50	0	197	9	101	26	0	136	47	26	6	0	79	27	46	18	1	91	503
Total	59	489	207	0	755	41	428	102	0	571	175	101	37	1	313	118	140	73	1	331	1970
Approach %	7.8	64.8	27.4	-	-	7.2	75.0	17.9	-	-	55.9	32.3	11.8	-	-	35.6	42.3	22.1	-	-	-
Total %	3.0	24.8	10.5	-	38.3	2.1	21.7	5.2	-	29.0	8.9	5.1	1.9	-	15.9	6.0	7.1	3.7	-	16.8	-
PHF	0.776	0.906	0.863	-	0.903	0.641	0.915	0.654	-	0.965	0.911	0.871	0.661	-	0.943	0.843	0.761	0.676	-	0.890	0.936
Lights	58	485	206	-	749	40	427	101	-	568	175	99	37	-	311	117	137	72	-	326	1954
% Lights	98.3	99.2	99.5	-	99.2	97.6	99.8	99.0	-	99.5	100.0	98.0	100.0	-	99.4	99.2	97.9	98.6	-	98.5	99.2
Buses	0	0	0	-	0	1	0	0	-	1	0	2	0	-	2	0	1	0	-	1	4
% Buses	0.0	0.0	0.0	-	0.0	2.4	0.0	0.0	-	0.2	0.0	2.0	0.0	-	0.6	0.0	0.7	0.0	-	0.3	0.2
Trucks	1	4	1	-	6	0	1	1	-	2	0	0	0	-	0	1	2	1	-	4	12
% Trucks	1.7	0.8	0.5	-	0.8	0.0	0.2	1.0	-	0.4	0.0	0.0	0.0	-	0.0	0.8	1.4	1.4	-	1.2	0.6
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	1	-	-	-	-	1	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	100.0	-	-

AECOM Corp
3950 Sparks Drive SE

Grand Rapids, Michigan, United States 49546
(616) 574-8500

Count Name: Napier Ave @ Union Ave
Site Code:
Start Date: 07/19/2018

Turning Movement Data

Start Time	Napier Ave Eastbound					Napier Ave Westbound					Union Ave Northbound					Union Ave Southbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
7:00 AM	1	39	4	0	44	5	53	7	0	65	4	3	7	0	14	5	5	0	0	10	133
7:15 AM	1	62	4	0	67	3	48	3	0	54	5	3	6	0	14	10	8	0	0	18	153
7:30 AM	0	67	5	0	72	4	59	6	0	69	5	7	13	0	25	10	10	0	0	20	186
7:45 AM	3	79	8	0	90	12	93	10	0	115	10	3	17	0	30	9	10	2	0	21	256
Hourly Total	5	247	21	0	273	24	253	26	0	303	24	16	43	0	83	34	33	2	0	69	728
8:00 AM	2	82	9	0	93	9	80	5	0	94	8	5	11	0	24	7	9	2	0	18	229
8:15 AM	0	79	5	1	84	3	72	6	0	81	13	6	5	0	24	9	7	0	0	16	205
8:30 AM	0	80	7	0	87	4	73	5	0	82	8	4	6	0	18	10	6	1	1	17	204
8:45 AM	3	66	11	0	80	12	84	6	0	102	8	5	7	0	20	11	6	3	0	20	222
Hourly Total	5	307	32	1	344	28	309	22	0	359	37	20	29	0	86	37	28	6	1	71	860
9:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:00 PM	4	143	5	0	152	7	123	19	0	149	5	9	17	0	31	13	8	0	0	21	353
2:15 PM	5	144	9	0	158	17	121	13	0	151	7	11	13	0	31	13	12	7	0	32	372
2:30 PM	2	156	11	0	169	14	132	16	0	162	3	11	9	0	23	26	9	3	0	38	392
2:45 PM	7	140	11	0	158	16	119	15	0	150	9	7	11	0	27	21	9	5	0	35	370
Hourly Total	18	583	36	0	637	54	495	63	0	612	24	38	50	0	112	73	38	15	0	126	1487
3:00 PM	3	134	9	0	146	10	136	16	1	162	11	6	15	0	32	19	9	3	0	31	371
3:15 PM	5	169	13	0	187	14	135	21	0	170	10	18	11	0	39	14	20	3	0	37	433
3:30 PM	3	185	17	0	205	9	139	16	0	164	12	14	9	0	35	12	14	2	0	28	432
3:45 PM	2	170	4	0	176	7	148	11	0	166	11	12	12	0	35	30	12	5	0	47	424
Hourly Total	13	658	43	0	714	40	558	64	1	662	44	50	47	0	141	75	55	13	0	143	1660
4:00 PM	5	152	12	0	169	13	139	21	2	173	10	15	15	0	40	21	9	3	0	33	415
4:15 PM	5	161	16	0	182	20	121	11	1	152	13	8	12	0	33	17	16	3	0	36	403
4:30 PM	2	153	16	0	171	22	170	16	0	208	9	12	21	0	42	23	13	0	0	36	457
4:45 PM	2	147	13	0	162	15	160	19	2	194	7	12	20	0	39	14	11	6	0	31	426
Hourly Total	14	613	57	0	684	70	590	67	5	727	39	47	68	0	154	75	49	12	0	136	1701
5:00 PM	8	175	10	0	193	20	143	24	0	187	10	10	14	1	34	16	14	11	0	41	455
5:15 PM	5	154	12	0	171	14	129	20	0	163	4	12	12	0	28	21	10	4	0	35	397
5:30 PM	3	138	10	2	151	16	123	20	1	159	10	10	11	0	31	12	13	7	0	32	373
5:45 PM	2	120	13	0	135	14	128	13	0	155	9	14	14	0	37	17	7	8	0	32	359
Hourly Total	18	587	45	2	650	64	523	77	1	664	33	46	51	1	130	66	44	30	0	140	1584
6:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	73	2995	234	3	3302	280	2728	319	7	3327	201	217	288	1	706	360	247	78	1	685	8020
Approach %	2.2	90.7	7.1	-	-	8.4	82.0	9.6	-	-	28.5	30.7	40.8	-	-	52.6	36.1	11.4	-	-	-
Total %	0.9	37.3	2.9	-	41.2	3.5	34.0	4.0	-	41.5	2.5	2.7	3.6	-	8.8	4.5	3.1	1.0	-	8.5	-
Lights	72	2937	231	-	3240	274	2681	311	-	3266	198	209	283	-	690	351	242	75	-	668	7864
% Lights	98.6	98.1	98.7	-	98.1	97.9	98.3	97.5	-	98.2	98.5	96.3	98.3	-	97.7	97.5	98.0	96.2	-	97.5	98.1
Buses	1	10	0	-	11	2	13	5	-	20	0	6	1	-	7	5	2	2	-	9	47
% Buses	1.4	0.3	0.0	-	0.3	0.7	0.5	1.6	-	0.6	0.0	2.8	0.3	-	1.0	1.4	0.8	2.6	-	1.3	0.6
Trucks	0	48	3	-	51	4	34	3	-	41	3	2	4	-	9	4	3	1	-	8	109
% Trucks	0.0	1.6	1.3	-	1.5	1.4	1.2	0.9	-	1.2	1.5	0.9	1.4	-	1.3	1.1	1.2	1.3	-	1.2	1.4
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	1	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	0.0	-	-	-	-	14.3	-	-	-	-	0.0	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	3	-	-	-	-	6	-	-	-	-	1	-	-	-	-	1	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	85.7	-	-	-	-	100.0	-	-	-	-	100.0	-	-

AECOM Corp
3950 Sparks Drive SE

Grand Rapids, Michigan, United States 49546
(616) 574-8500

Count Name: Napier Ave @ Union Ave
Site Code:
Start Date: 07/19/2018

Turning Movement Peak Hour Data (7:45 AM)

Start Time	Napier Ave Eastbound					Napier Ave Westbound					Union Ave Northbound					Union Ave Southbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
7:45 AM	3	79	8	0	90	12	93	10	0	115	10	3	17	0	30	9	10	2	0	21	256
8:00 AM	2	82	9	0	93	9	80	5	0	94	8	5	11	0	24	7	9	2	0	18	229
8:15 AM	0	79	5	1	84	3	72	6	0	81	13	6	5	0	24	9	7	0	0	16	205
8:30 AM	0	80	7	0	87	4	73	5	0	82	8	4	6	0	18	10	6	1	1	17	204
Total	5	320	29	1	354	28	318	26	0	372	39	18	39	0	96	35	32	5	1	72	894
Approach %	1.4	90.4	8.2	-	-	7.5	85.5	7.0	-	-	40.6	18.8	40.6	-	-	48.6	44.4	6.9	-	-	-
Total %	0.6	35.8	3.2	-	39.6	3.1	35.6	2.9	-	41.6	4.4	2.0	4.4	-	10.7	3.9	3.6	0.6	-	8.1	-
PHF	0.417	0.976	0.806	-	0.952	0.583	0.855	0.650	-	0.809	0.750	0.750	0.574	-	0.800	0.875	0.800	0.625	-	0.857	0.873
Lights	5	315	28	-	348	27	306	25	-	358	38	17	38	-	93	32	31	4	-	67	866
% Lights	100.0	98.4	96.6	-	98.3	96.4	96.2	96.2	-	96.2	97.4	94.4	97.4	-	96.9	91.4	96.9	80.0	-	93.1	96.9
Buses	0	2	0	-	2	0	2	1	-	3	0	1	0	-	1	2	1	1	-	4	10
% Buses	0.0	0.6	0.0	-	0.6	0.0	0.6	3.8	-	0.8	0.0	5.6	0.0	-	1.0	5.7	3.1	20.0	-	5.6	1.1
Trucks	0	3	1	-	4	1	10	0	-	11	1	0	1	-	2	1	0	0	-	1	18
% Trucks	0.0	0.9	3.4	-	1.1	3.6	3.1	0.0	-	3.0	2.6	0.0	2.6	-	2.1	2.9	0.0	0.0	-	1.4	2.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	1	-	-	-	-	0	-	-	-	-	0	-	-	-	-	1	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-

Turning Movement Peak Hour Data (4:15 PM)

Start Time	Napier Ave Eastbound					Napier Ave Westbound					Union Ave Northbound					Union Ave Southbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
4:15 PM	5	161	16	0	182	20	121	11	1	152	13	8	12	0	33	17	16	3	0	36	403
4:30 PM	2	153	16	0	171	22	170	16	0	208	9	12	21	0	42	23	13	0	0	36	457
4:45 PM	2	147	13	0	162	15	160	19	2	194	7	12	20	0	39	14	11	6	0	31	426
5:00 PM	8	175	10	0	193	20	143	24	0	187	10	10	14	1	34	16	14	11	0	41	455
Total	17	636	55	0	708	77	594	70	3	741	39	42	67	1	148	70	54	20	0	144	1741
Approach %	2.4	89.8	7.8	-	-	10.4	80.2	9.4	-	-	26.4	28.4	45.3	-	-	48.6	37.5	13.9	-	-	-
Total %	1.0	36.5	3.2	-	40.7	4.4	34.1	4.0	-	42.6	2.2	2.4	3.8	-	8.5	4.0	3.1	1.1	-	8.3	-
PHF	0.531	0.909	0.859	-	0.917	0.875	0.874	0.729	-	0.891	0.750	0.875	0.798	-	0.881	0.761	0.844	0.455	-	0.878	0.952
Lights	17	625	55	-	697	74	591	69	-	734	37	40	66	-	143	68	54	20	-	142	1716
% Lights	100.0	98.3	100.0	-	98.4	96.1	99.5	98.6	-	99.1	94.9	95.2	98.5	-	96.6	97.1	100.0	100.0	-	98.6	98.6
Buses	0	0	0	-	0	1	2	0	-	3	0	1	0	-	1	0	0	0	-	0	4
% Buses	0.0	0.0	0.0	-	0.0	1.3	0.3	0.0	-	0.4	0.0	2.4	0.0	-	0.7	0.0	0.0	0.0	-	0.0	0.2
Trucks	0	11	0	-	11	2	1	1	-	4	2	1	1	-	4	2	0	0	-	2	21
% Trucks	0.0	1.7	0.0	-	1.6	2.6	0.2	1.4	-	0.5	5.1	2.4	1.5	-	2.7	2.9	0.0	0.0	-	1.4	1.2
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	0.0	-	-	-	-	0.0	-	-	-	-	-	-	-
Pedestrians	-	-	-	0	-	-	-	-	3	-	-	-	-	1	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	-	-	-

AECOM Corp
3950 Sparks Drive SE

Grand Rapids, Michigan, United States 49546
(616) 574-8500

Count Name: Napier Ave @ M-139
Site Code:
Start Date: 07/19/2018

Turning Movement Data

Start Time	Napier Ave Eastbound					Napier Ave Westbound					M-139 Northbound					M-139 Southbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
7:00 AM	10	37	8	0	55	8	35	5	0	48	19	39	6	0	64	2	23	9	0	34	201
7:15 AM	10	42	15	0	67	19	50	6	0	75	14	48	9	0	71	1	32	4	1	37	250
7:30 AM	19	71	18	0	108	14	57	5	0	76	13	71	9	0	93	6	51	5	3	62	339
7:45 AM	16	69	22	0	107	14	81	5	0	100	35	77	15	0	127	6	59	11	0	76	410
Hourly Total	55	219	63	0	337	55	223	21	0	299	81	235	39	0	355	15	165	29	4	209	1200
8:00 AM	18	61	21	0	100	12	62	15	0	89	21	53	12	0	86	10	42	12	0	64	339
8:15 AM	18	70	23	0	111	13	57	9	0	79	22	75	9	0	106	5	38	11	0	54	350
8:30 AM	20	60	23	0	103	15	51	12	0	78	22	74	13	0	109	14	48	19	0	81	371
8:45 AM	21	55	31	0	107	13	70	10	0	93	27	41	15	0	83	7	50	15	0	72	355
Hourly Total	77	246	98	0	421	53	240	46	0	339	92	243	49	0	384	36	178	57	0	271	1415
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2:00 PM	35	111	54	0	200	25	76	28	0	129	54	79	27	0	160	22	73	19	0	114	603
2:15 PM	24	112	47	0	183	19	65	21	0	105	58	95	16	0	169	17	84	31	0	132	589
2:30 PM	19	128	25	0	172	17	87	23	0	127	53	64	19	0	136	25	89	21	0	135	570
2:45 PM	18	123	48	0	189	19	66	13	0	98	64	104	21	0	189	23	69	26	0	118	594
Hourly Total	96	474	174	0	744	80	294	85	0	459	229	342	83	0	654	87	315	97	0	499	2356
3:00 PM	29	96	40	0	165	22	79	30	0	131	51	69	21	0	141	17	84	21	2	122	559
3:15 PM	26	133	52	0	211	29	93	24	0	146	58	95	20	0	173	17	66	26	0	109	639
3:30 PM	27	124	57	0	208	19	85	17	0	121	57	93	23	0	173	28	84	24	0	136	638
3:45 PM	33	127	57	1	217	19	69	24	0	112	59	108	28	0	195	28	102	35	0	165	689
Hourly Total	115	480	206	1	801	89	326	95	0	510	225	365	92	0	682	90	336	106	2	532	2525
4:00 PM	27	132	49	0	208	27	78	21	0	126	62	101	29	0	192	24	97	26	0	147	673
4:15 PM	33	118	46	0	197	20	97	26	0	143	54	91	20	0	165	21	72	23	0	116	621
4:30 PM	22	132	54	0	208	20	98	19	0	137	71	92	21	0	184	37	93	34	0	164	693
4:45 PM	17	111	53	0	181	27	100	24	0	151	60	119	20	0	199	25	110	30	0	165	696
Hourly Total	99	493	202	0	794	94	373	90	0	557	247	403	90	0	740	107	372	113	0	592	2683
5:00 PM	31	130	60	0	221	29	95	22	0	146	55	81	14	0	150	26	105	37	0	168	685
5:15 PM	30	116	46	0	192	19	95	15	0	129	65	100	18	0	183	15	98	25	0	138	642
5:30 PM	19	102	38	0	159	21	84	17	0	122	53	81	28	0	162	24	76	19	1	119	562
5:45 PM	17	93	43	0	153	22	85	16	0	123	68	72	18	0	158	24	68	27	0	119	553
Hourly Total	97	441	187	0	725	91	359	70	0	520	241	334	78	0	653	89	347	108	1	544	2442
Grand Total	539	2353	930	1	3822	462	1815	407	0	2684	1115	1922	431	0	3468	424	1713	510	7	2647	12621
Approach %	14.1	61.6	24.3	-	-	17.2	67.6	15.2	-	-	32.2	55.4	12.4	-	-	16.0	64.7	19.3	-	-	-
Total %	4.3	18.6	7.4	-	30.3	3.7	14.4	3.2	-	21.3	8.8	15.2	3.4	-	27.5	3.4	13.6	4.0	-	21.0	-
Lights	523	2305	912	-	3740	452	1768	401	-	2621	1096	1883	422	-	3401	414	1650	499	-	2563	12325
% Lights	97.0	98.0	98.1	-	97.9	97.8	97.4	98.5	-	97.7	98.3	98.0	97.9	-	98.1	97.6	96.3	97.8	-	96.8	97.7
Buses	7	9	5	-	21	1	12	2	-	15	7	12	0	-	19	3	23	4	-	30	85
% Buses	1.3	0.4	0.5	-	0.5	0.2	0.7	0.5	-	0.6	0.6	0.6	0.0	-	0.5	0.7	1.3	0.8	-	1.1	0.7
Trucks	9	39	13	-	61	9	35	4	-	48	12	27	9	-	48	7	40	7	-	54	211
% Trucks	1.7	1.7	1.4	-	1.6	1.9	1.9	1.0	-	1.8	1.1	1.4	2.1	-	1.4	1.7	2.3	1.4	-	2.0	1.7
Bicycles on Crosswalk	-	-	-	1	-	-	-	-	0	-	-	-	-	0	-	-	-	-	1	-	-
% Bicycles on Crosswalk	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14.3	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	6	-	-
% Pedestrians	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	85.7	-	-

AECOM Corp
3950 Sparks Drive SE

Grand Rapids, Michigan, United States 49546
(616) 574-8500

Count Name: Napier Ave @ M-139
Site Code:
Start Date: 07/19/2018

Turning Movement Peak Hour Data (7:45 AM)

Start Time	Napier Ave Eastbound					Napier Ave Westbound					M-139 Northbound					M-139 Southbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
7:45 AM	16	69	22	0	107	14	81	5	0	100	35	77	15	0	127	6	59	11	0	76	410
8:00 AM	18	61	21	0	100	12	62	15	0	89	21	53	12	0	86	10	42	12	0	64	339
8:15 AM	18	70	23	0	111	13	57	9	0	79	22	75	9	0	106	5	38	11	0	54	350
8:30 AM	20	60	23	0	103	15	51	12	0	78	22	74	13	0	109	14	48	19	0	81	371
Total	72	260	89	0	421	54	251	41	0	346	100	279	49	0	428	35	187	53	0	275	1470
Approach %	17.1	61.8	21.1	-	-	15.6	72.5	11.8	-	-	23.4	65.2	11.4	-	-	12.7	68.0	19.3	-	-	-
Total %	4.9	17.7	6.1	-	28.6	3.7	17.1	2.8	-	23.5	6.8	19.0	3.3	-	29.1	2.4	12.7	3.6	-	18.7	-
PHF	0.900	0.929	0.967	-	0.948	0.900	0.775	0.683	-	0.865	0.714	0.906	0.817	-	0.843	0.625	0.792	0.697	-	0.849	0.896
Lights	66	251	86	-	403	54	237	40	-	331	95	269	45	-	409	35	173	51	-	259	1402
% Lights	91.7	96.5	96.6	-	95.7	100.0	94.4	97.6	-	95.7	95.0	96.4	91.8	-	95.6	100.0	92.5	96.2	-	94.2	95.4
Buses	3	3	1	-	7	0	3	0	-	3	2	2	0	-	4	0	6	0	-	6	20
% Buses	4.2	1.2	1.1	-	1.7	0.0	1.2	0.0	-	0.9	2.0	0.7	0.0	-	0.9	0.0	3.2	0.0	-	2.2	1.4
Trucks	3	6	2	-	11	0	11	1	-	12	3	8	4	-	15	0	8	2	-	10	48
% Trucks	4.2	2.3	2.2	-	2.6	0.0	4.4	2.4	-	3.5	3.0	2.9	8.2	-	3.5	0.0	4.3	3.8	-	3.6	3.3
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Turning Movement Peak Hour Data (4:30 PM)

Start Time	Napier Ave Eastbound					Napier Ave Westbound					M-139 Northbound					M-139 Southbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
4:30 PM	22	132	54	0	208	20	98	19	0	137	71	92	21	0	184	37	93	34	0	164	693
4:45 PM	17	111	53	0	181	27	100	24	0	151	60	119	20	0	199	25	110	30	0	165	696
5:00 PM	31	130	60	0	221	29	95	22	0	146	55	81	14	0	150	26	105	37	0	168	685
5:15 PM	30	116	46	0	192	19	95	15	0	129	65	100	18	0	183	15	98	25	0	138	642
Total	100	489	213	0	802	95	388	80	0	563	251	392	73	0	716	103	406	126	0	635	2716
Approach %	12.5	61.0	26.6	-	-	16.9	68.9	14.2	-	-	35.1	54.7	10.2	-	-	16.2	63.9	19.8	-	-	-
Total %	3.7	18.0	7.8	-	29.5	3.5	14.3	2.9	-	20.7	9.2	14.4	2.7	-	26.4	3.8	14.9	4.6	-	23.4	-
PHF	0.806	0.926	0.888	-	0.907	0.819	0.970	0.833	-	0.932	0.884	0.824	0.869	-	0.899	0.696	0.923	0.851	-	0.945	0.976
Lights	99	485	210	-	794	94	386	79	-	559	251	386	72	-	709	102	400	126	-	628	2690
% Lights	99.0	99.2	98.6	-	99.0	98.9	99.5	98.8	-	99.3	100.0	98.5	98.6	-	99.0	99.0	98.5	100.0	-	98.9	99.0
Buses	0	1	0	-	1	0	0	0	-	0	0	2	0	-	2	1	2	0	-	3	6
% Buses	0.0	0.2	0.0	-	0.1	0.0	0.0	0.0	-	0.0	0.0	0.5	0.0	-	0.3	1.0	0.5	0.0	-	0.5	0.2
Trucks	1	3	3	-	7	1	2	1	-	4	0	4	1	-	5	0	4	0	-	4	20
% Trucks	1.0	0.6	1.4	-	0.9	1.1	0.5	1.3	-	0.7	0.0	1.0	1.4	-	0.7	0.0	1.0	0.0	-	0.6	0.7
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-